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Advertisement Index, see page xxxvi.

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VOL. LXXXV. OCTOBER 24, 1919. No. 2,187.

ELECTRICAL REVIEW.

Vol. LXXXV.] CONTENTS: October 24, 1919. [No. 2,187.

	Page
Our Pressing Industrial Problems	513
The Electrical Industry	514
The Right to Increase Charges for Electricity	514
The Neuhausen Aluminium Industry Co.	515
Electric Vehicles at Sheffield	515
The I.E.C. Plenary Meeting	515
Nationalisation	516
Mr. Hirst on the Position of the Electrical Industry	517
The "Fuel of the Future" and the Gas Companies	518
The Electrical Contractors' Association (Inc.)	519
Electric Vehicles at Sheffield	520
The I.E.E. Visit to Holland (*illus.*)	520
The International Electrotechnical Commission (*illus.*) ...	521
Correspondence—	
Labour Conditions in South Africa	522
Trade in Australia	523
Legal	524
Business Notes	524
Notes	531
City Notes	535
Stocks and Shares	535
Market Quotations	536
The Improvement of Power Factor, by E. W. Dorey (*illus.*) (*continued*)	537
Direction-Finding by Wireless Telegraphy, by H. R. Sankey (*illus.*) (*concluded*)	539
The London Underground Railways (*concluded*)	540
Exports and Imports of Electrical Goods during Sept., 1919	541
The Shipping, Engineering and Machinery Exhibition (*concluded*)	542
New Patents Applied for, 1919	544
Abstracts of Published Specifications	544
Contractors' Column ... ... Advertisement page	xxvi

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OUR PRESSING INDUSTRIAL PROBLEMS.

NONE of the speeches recently delivered by public men go far to clear the industrial atmosphere. We are all on the watch for some man of super-intelligence who will make a really practical proposal which will commend itself to Capital and Labour and to the community. The probability is that there is no such man living, and we shall continue to be surfeited with reiterated generalities. Sir Auckland Geddes foretells disastrous times, very much worse than the country passed through in the early part of last century after the Napoleonic wars—the period that led up to the Chartist riots—unless we establish a large foreign trade. We should be making at the present time, he says, "the greatest possible national effort to get our goods, our products, flowing overseas in the greatest possible volume that energy and ingenuity can create." He suggests that the Home market will be less attractive than it was before the war, and with regard to the iron and steel trade, which we thought had done so much already to work out its own salvation, he appears to predict for it a bad time because so many people are making so much money on its industrial side that they are not really struggling to develop the industry to meet the strain of competition that it will experience from other producing countries when they get back to their stride. We must leave the iron and steel trades to answer the charge of indifference regarding the future. Sir Auckland appears to see giants in the way, though when others fear them they are but "shadows." But whatever the reasons for his view that export trade must be developed if we are to escape disaster, we fully agree with that assertion. We can increase our exportation by increasing production. There is nothing new in that suggestion now; the difficulty, however, still is how to secure the workers' co-operation. Certainly we must place the most modern machinery and motive power at their disposal, so that, whether or not there is more work done by the individual employé, he will produce more. We supposed that in numerous factories modern equipment had been introduced under war conditions, and that, or its equivalent in efficiency, would never be dispensed with again. The provision of ample and cheap motive power is already being prepared for so far as legislation can do it, though it will be a long time before Acts of Parliament make the needed supply available everywhere, even if manufacturers are willing to make that greater use of it that they should do. These are matters which must be expedited, but there is the *immediate* need to secure the greater output, and pending the increased consumption of power in industrial life which shall put us on a better basis in comparison with America and Germany, we must do something to secure a greater spirit of co-operation on the part of those who do the producing. To our deep regret the speeches of those who suggest how this is to be brought about, do not

contain anything substantially different from what has been advanced during the last few years. Prof. Kirkaldy holds that the present disturbed state of mind is due to the haunting dread of unemployment following upon the production, with methods of efficiency, of a pre-war yearly output in less than six months. We believe it to be perfectly true that reasonable as are the great mass of people in these islands, a period of serious unemployment would be more difficult to cope with to-day than in those far-off days to which Sir Auckland Geddes alluded, and nothing would so surely lead to excesses that might eventuate in serious disaster to the whole industrial system. Mr. W. L. Hichens finds no substitute for the present industrial system ; it has been built up on certain principles which, if swept away, might mean the sweeping away of the whole fabric of industry. To save the system then we must avoid excesses ; to do that we must work so as to prevent unemployment on a large scale. Prof. Kirkaldy considers that this can be done if—. Sir Auckland Geddes holds that the outlook need not be so gloomy if—. Those two ifs are very much alike. The professor says that the world demand is so great that there is plenty of work in prospect, though we may produce 12 months' output in less than six. The president says the same, and adds : In the name of Heaven go out and get the business ! Now where are we ? Mr. Hichens does not consider that the principle of Capital receiving profit in industry is wrong, and he holds that it must continue. We agree. He does not hold with nationalisation as an alternative. Nor do we. What he advocates, as he has done so admirably, and with characteristic persuasiveness and force, on so many occasions, is self-government in industry, and securing a system under which complete justice can be obtained as between the employer, the worker, and the consumer. Yes, that is what we all want, but aspirations will not suffice while the nation waits. What then are we to do ? Here we admit the view of Lord Robert Cecil : "Let us make men partners in industry !" Even here we have no Daniel come to judgment. Everybody wants to stimulate the workers' interest in industry nowadays. The remedy is in many mouths—we have dared to advocate it ourselves in these pages for years past. Yet in how many cases is it being applied ? How often, too, in the past has it failed in practice ? And how frequently have negotiations for its introduction broken down ? Who will find the way for removing the suspicion from the minds of employés who dislike earning profits for "masters" who nurse in their exclusive bosoms the results of their own and their employés' efforts ? Mr. Gosling says that some employers are splendid, "but the great majority did not give the wages that the business could afford but only the wages which they were compelled to give." The fact is that we live in just about the same suspicious atmosphere as in the past, but the situation has become more difficult, because the higher cost of living has put men in constant bondage, in spite of the fact that, as Mr. H. F. Massey told the Manchester Association of Engineers, we have successfully fought a war for Freedom. We have said again and again that we do not believe that co-partnership arrangements with paltry percentages of profits on a wage basis are going to bring Peace in industry or act as an incentive to greater effort. Pittances doled out have not the flavour of "profits." Nor do we see how Labour is going to be content to share the losses when there are no profits to divide. We believe that it was Mr. Hichens who said, a year or two ago, that somebody must settle what was a fair share of reward for Labour in return for its work, and what a fair share of return for capital invested and risks run. By arriving at such an understanding as that we are likely to put men on the footing of "partners in industry," but there will always remain the important need for ensuring that the return permitted to capital shall not be so low as to frighten money away from industry. The chance, or prospect, of profit is an incentive to enterprise. Enterprise brings prosperity. Enterprise is needed among those who can go out and get the business, as Sir Auckland urges, and it is essential among those who can open up industrial developments creating employment. Unfairly limit profit-earning possibilities and enterprise will be unwisely limited and there will be unemployment.

All of which review of recent utterances leaves us with the impression that there is no new practical contribution available helping toward a better understanding or happier relationship. We have the New World that we were promised, but, as somebody has remarked, it is not quite a Utopia. We are still the same selfish people as we always were, and added to this there is present the "Audacity" which the Premier counselled Labour to employ in framing its demands. Perhaps we may depend upon the common sense of the British nation winning out in the end, and upon hard work and a greater spirit of common interest taking the place of our hankering will-o'-the-wisp fashion after ideals which can only gradually be attained to. Evolution not revolution !

The Electrical Industry.

We commend as deserving of careful study the article appearing on another page to-day, in which are set forth the views of Mr. H. Hirst on some matters of interest in relation to the electrical industry. First, we may congratulate the Batti-Wallahs on securing him as their guest, and in inducing him to offer his observations at this important turning-point in British electrical manufacturing. They have begun the season well, and we wish them every success. We have frequently endeavoured to impress upon our readers the glorious future that is about to open out for the industry ; as we remarked again only last week, there is no limit to its age or to its possibilities. If everybody connected with it soon settles down to working harder, whether with brain, with machinery, or with muscle, its position ought to be made secure and far more prosperous than in pre-war years. The industry is large, and it contains to-day some very large concerns. Large concerns demand and stimulate large views. Mr. Hirst has long been one of the great captains of the British electrical industry. He is chairman of one of the largest concerns, and has never allowed himself, either in policy or practice, to be a man of small conceptions. Men at the heads of large undertakings are better able to take large views of industry than are some other people. The speech to which we allude to-day embodies a number of suggestions which are obviously the result of persistently looking ahead, and of declining to be pre-occupied or overcome by immediate and clamouring details. He sees, as we have ourselves done in these columns on many occasions, the need for our young men to secure a large idea of the world free from the trammels of local tradition. He points to the benefits that must accrue from the closer relationship which has been brought about among manufacturing interests which for far too long went each its own way to the detriment of all. He sees the immensity of the opportunity that awaits the whole electrical industry, looks beyond the period of the "American danger," and counsels all and sundry to settle down to hard work to secure greater production as a means of higher efficiency and of establishing British industry on a firm foundation throughout the world. We welcome his address as that of an optimist who looks ahead, and is well ahead.

The Right to Increase Charges for Electricity.

It has been brought to our notice that a local authority supplying electricity in accordance with the terms of a provisional order has recently issued a notice demanding the payment of increased charges. Doubtless the notice was issued pursuant to an order made under Sec. 1 (1) of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, which provides that, "Where it appears to the appropriate Government Department that the financial position of any undertaking . . . has been adversely affected by circumstances arising out of the present war, the Department may, if they think fit, by order provide for the modification of any statutory provisions regulating the charges to be made by the undertakers, and of any statutory provisions consequential on or supplemental to any such provisions as aforesaid, for such period during the continuance of this Act, in such manner,

and subject to such conditions, as appear to the department to be just and reasonable, provided that . . ." There follow certain provisoes which are not material for our present purpose. The Act remains in force for two years after the end of the war. An order duly made clearly gives the right to levy increased charges, but the question which arises upon the notice issued by the local authority above referred to, is—Can the rate of charge be raised retrospectively? The notice in question was issued on September 1st, 1919. It stated that "the charges for electricity have been increased," and that "the following Tariff will take effect as from the date of the reading of the meters for the June quarter, 1919." The new charges for lighting and power were then specified. We have not seen a copy of the "order" under which this notice was issued. Possibly it states that an increase may be declared to be retrospective in its operation. While the language of the material section appears to be wide enough to enable the Government Department so to order, we venture to express the view that, unless the order so provides, the levy of a retrospective increase would be illegal. How could it be justified? It is a matter of contract. The consumer agrees to pay so much for energy supplied. The quantum payable is ascertained at stated intervals when his meter is read. In the case in question the consumer was using his lamps, &c., for several months in the belief that he was to pay xd. a unit. He now finds that he has to pay $x + y$d. Had he known that he was to pay $x + y$d. from June, he might have reduced his consumption or taken any other available step to reduce his liability. No landlord could suddenly announce that he was going to increase the rent due for an expired term. Possibly this reference to the matter in our columns may elicit, for the benefit of the electric lighting world generally, some information as to the usual terms of orders made by "the appropriate Government Department" for the purpose of carrying the Act into effect.

The Neuhausen Aluminium Industry Co.

Now that the war is over, and Germany is definitely defeated—only under these circumstances, it is well to emphasise—the German directors forming part of the board of the Aluminium Industrie A.G., of Neuhausen, have retired from the directorate, as from October 1st, 1919. The directors are Carl Chrambach, banker; Carl Furstenberg; General Consul Eugen Landau; P. Mankiewicz, bank director; and E. Schroeder, engineer, of Dusseldorf. The withdrawal of these individuals is said to have been prompted by the desire to facilitate the re-acquisition of the company's property in France. It will be remembered that the company is financially interested in the Société Française pour l'Industrie de l'Aluminium and the Société Anonyme des Bauxites de Frouée, of Marseilles, the latter producing crude bauxite and the former turning out calcined alumina. Shortly after the beginning of the war both companies were placed under French sequestration, on the ground, as was alleged, of German participation in the Aluminium Industrie A.G. and the presence of German directors on the board. The sequestration still continues at the present time, but negotiations are proceeding with a view to its removal. We know nothing of the real circumstances which dictated the action of the French authorities five years ago, but it is obvious that if the German directors had desired to assist the Neuhausen company in the respect mentioned they would have retired long ago, and not waited until the present time before handing in their resignations, which, after all, may be merely a nominal withdrawal, capable of permitting of a resumption of the former state of affairs when conditions are favourable for the purpose. At the same time, the cause of the Neuhausen company will not have been advanced by the violent attack, evidently made on behalf of the German directors and the German interests in the company, which has just been made by a Frankfort newspaper on the French authorities and the French aluminium industry in connection with the maintenance of the sequestration.

Electric Vehicles at Sheffield.

That Sheffield is an ever-progressive city is a well-known fact. As a centre of the iron and steel industry, it needs no advertisement, and in the electrical world its reputation is equally well known, as instanced by the enormous growth of its electricity supply department, and of the use of electric steel furnaces during the war. In spite of its past achievements, however, the city is by no means content to rest on its laurels, and a watchful eye is kept on innovations calculated to lead to increased efficiency and productiveness.

In this connection we would direct attention to the City Council's recent decision to expend a sum of £100,000 on the purchase of electric vehicles to be used for refuse collection. Briefly, it is proposed to substitute electric for horse haulage, and the total cost of the scheme will be spread over a period, which, it is thought, should not be longer than six years.

The scheme will require the provision of about 51 additional vehicles, bringing the total number of vehicles owned by the city up to between 60 and 70, and suitable garage accommodation, with complete battery-charging and other equipment which such a fleet necessitates, is also to be provided.

In a report on the matter, an abstract of which will be found on another page, Mr. J. A. Priestley, the superintendent of the cleansing department, gives it as his opinion that only by the use of electric vehicles can the present condition of arrears in the collection of house refuse in the city be overcome. Moreover, the experience of the past four years with electric vehicles has demonstrated that the work can be done by their agency more expeditiously and economically than by horse haulage. For house-to-house collection work the electric vehicle, says the report, cannot be approached by petrol motors; steam wagons approach more nearly to the electrics in suitability and economy for this class of work, but the latter possess advantages in noiselessness and ease of manœuvring that are not shared by steam wagons.

In conclusion, we congratulate the City Council on its decision in this matter; although the initial expenditure may appear to be large, it will be the most economical in the long run. We are confident that there will be no cause to regret this step, and that the Council's experience with electric vehicles, which has been eminently satisfactory in the past, will be no less gratifying in the future.

The I.E.C. Plenary Meeting.

It is interesting, as the great war recedes further and further into the background, to observe the machinery of the various organisations, which has been at a standstill for five years, gradually getting into motion again. We know not what is before us, what crises we shall yet have to pass through, or what changes may be wrought in the structure of society; but it is our plain duty to "carry on," and to lubricate the wheels of progress by every possible means. Hence we were glad to be present at the opening of the fourth plenary meeting of the International Electrotechnical Commission, which was held this week by representatives of the Allied and neutral nations, but naturally was not graced by the presence of delegates from that country which, as one speaker remarked, had always endeavoured to dominate the proceedings and to turn them to its own advantage.

The most important item in the agenda was the question of the rating of electrical machinery, on which a Special Committee sat continuously. This is a matter of vital moment to the electrical export trade, and we note with pleasure that increasing attention is being given to the work of the I.E.C. by the manufacturers of the world, who are now co-operating with a view to the preparation of standards recognised by all nations. The Commission is doing work of the greatest value, and we wish all success to its labours.

NATIONALISATION.

Mr. Smillie and his friends of the Trade Union Congress failed entirely to convince Mr. Lloyd George of the desirability of nationalising the coal mines in this country, at the Downing Street meeting held on the 7th inst., to which we referred in our notes last week. It may be remembered that the meeting took place at the instance of the Trade Union Congress, to demand that the Government put into force the nationalisation of mines, as recommended by the majority report of the Sankey Commission, and failing a satisfactory reply, the Congress is to be summoned together again, to decide what steps shall be taken to enforce the miners' demands. Since, however, the Government stiffened its back with regard to the railway strike, we are inclined to believe that moderate counsels will prevail, and we cannot think that in face of Mr. Lloyd George's reply to the deputation the Trade Union Congress will be foolish enough to back up the extremists to the extent of "paralysing all industry" by calling a general strike, to force the Government to yield to a demand which would benefit nobody, but which certainly would damage trade and industry in this country, and if persisted in would eventually end in disaster.

The Government propose to nationalise the royalties and mineral rights, but they have yielded a step in the wrong direction when they propose to make a deduction from the purchase price, and expend the money, as Mr. Lloyd George said, "upon improving the conditions in the mining villages." Such legislation as this, in addition to being against all British standards of justice, does not do any good, and like the minimum wage, and Government doles, tends towards the degradation and pauperisation of those it is intended to benefit.

Mr. Smillie, the first spokesman on behalf of the miners, made a series of general charges, on the question of the Government not fulfilling its pledge in regard to nationalisation, and on "safety" and "output"; but could not adduce any facts or reasons to prove or advance his claim. In effect it was this:—The mines are unsafe because they are worked for private profit, and the shareholders insist that the manager shall give all his attention to output, and little or none to the care and safety of the workpeople; that the mines are not properly developed, or inventions made full use of. It is hardly conceivable that such utter nonsense could be put forward seriously by any intelligent person—let alone by one who claims to know what he is talking about. On the question of safety, the Prime Minister administered to Mr. Smillie a well-deserved rebuke. Under the Coal Mines Regulation Act, the miners at each pit can appoint two men to examine and report upon the general condition and safety of the mine, and they can always call upon H.M. Inspector of Mines to have matters put right if they are not satisfied. As to development and output, Mr. Lloyd George failed to see how the Government could improve these matters by nationalising the mines. He pointed out the highly speculative character of coal mining, and how though it was possible to prove by "boring" the presence of coal, after spending huge sums of money, it yet might not be found in paying quantity. Mr. Smillie's and Mr. Straker's remarks that the full section of the seam can be obtained by "boring" is no answer, as they know, or ought to know, that "faults" and other geological troubles may and do interfere to such an extent that the shafts are either abandoned or worked without profit or even at a loss, in the hope of getting through them.

With regard to strikes, Mr. Hodges suggested that under nationalisation there would be "none of these spasmodic stoppages"; but at the same time he did "not accept the view that it ought to be a part of the existing law that when a man went to work he could not under any circumstances come out on strike." In other words, it is to be "heads I win, tails you lose." On the question of a "decisive voice" or an "effective voice" or "effective control," in the management of the mines, there seems to be some confusion. Mr. Brace said they did not want a majority on the boards of control, yet we have no doubt that what Mr. Hodges had in mind, and what he expects to get is "effective control," to the exclusion of the management or owners, whether present owners, or owned by the State, and he thought the Prime Minister must be under a misapprehension when he suggested otherwise. The Prime Minister, too, quite rightly pointed out that it did not appear from recent experience that men would work more loyally or any harder because they were working for the State. Also that municipal workmen did not work any better than those of any private firm, but rather the reverse. Mr. Lloyd George drew attention to the great output per man in American mines, when Mr. Smillie quickly retorted that this was due to the introduction of machinery, but when told that Mr. Hoover tried to introduce machinery into the South Wales mines and failed owing to the objection of the men, he made no reply. Mr. Hodges remarked that it would probably be a dispute about the "price list." This is very likely, as it has been a common experience for men to refuse any reduction from the cost of "hand-getting" after the introduction of machinery. They alone were to reap all the benefits of the use of the plant, whilst the owners were to pay for it. Such is the miners' idea of right and justice.

Mr. Lloyd George said the Government could not accept nationalisation as demanded by the miners, that there would be no advantage to be derived from it either for the miners themselves or for all the other industries that depended so much upon a cheap supply of coal. The Government were prepared to nationalise all the mineral rights, and to introduce a system of unification of the coal trade by dividing it into districts, and giving the miners representation on the boards of directors, and further, to institute pit committees whereby the miners would have a voice in the control of the mine in so far as health and safety were concerned. This the miners declined to accept, and it remains now to be seen what further action the Trade Union Congress will take, but we do not think for one moment it will go to extremes.

Apparently this great question is to be made the labour "plank" at the next General Election, and the miners are now holding meetings all over the country with the object of influencing public opinion. This is quite right and proper, and we are quite sure the public will benefit from a full, frank, and free discussion of the subject, provided it is carried out honestly and fairly. But when we find men like Mr. Hodges informing an audience that the miner gets 2s. 6d. per ton, for which the consumer pays £2 10s., thereby insinuating that £2 7s. 6d. goes into the pockets of the shareholders, mine owners, and royalty owners, what are we to expect?

We have every sympathy with the miner, we wish him to have, as everyone does, the very best conditions, the shortest hours, and the highest wages the industry can afford, but in very truth his present wages and conditions compare very favourably indeed with those of workers in other industries. To a very great extent further improvement lies with himself, and a little more individual effort would easily increase the output by 15 to 20 per cent., to the advantage of the miner and the well-being of this great country and Empire.

MR. HIRST ON THE POSITION OF THE ELECTRICAL INDUSTRY.

At the luncheon with which the Batti-Wallahs opened the winter season on Monday last, Mr. H. Hirst, chairman of the General Electric Co., Ltd., who was present as guest, gave a brief review of some outstanding matters of interest in connection with the electrical industry. Before the war, in comparison with our formidable competitors abroad, we had small disjointed and more or less struggling concerns. He used to consider that one of the principal causes was free importation, which, while it might be good for other industries, meant for the electrical industry an unreasonable number of patterns and types. It meant heavy overhead charges on small output, depression of prices, and no margin for development or for enterprise. We watched the big doings of our competitors abroad, helpless to make ourselves felt to any extent. Electrical enterprise was also limited by municipal frontiers which meant the creation of small units with heavy non-productive charges, and the manufacturers had to produce 40, 50 or 100 types of commodity where our foreign competitors had to make only three or four types. Very considerable overhead charges were the result. We must get out of the cramped condition of the industry. We might or might not get Protection; might or might not get preference within the Empire, good Trade Marks or Patent Acts, and super-power stations—the Government would do many things for us, but it would not help us unless we helped ourselves. The first advice he would give for helping ourselves was: we must Work—work very hard—particularly in the electrical industry, and we must make others work. We must realise that the worker to-day claimed more of the comforts of life. He had to have higher wages and more leisure, but during the hours when he was supposed to work he must work with highest efficiency. Engineers must supply him with the brain and the tools to obtain that efficiency so that we could get an output which compared with the output man for man, hour for hour, of other countries. In order to supply brain to the worker we must think of education. He asked whether it was not desirable to standardise education throughout the Empire. They had found in the electrical industry that we suffered from the absence of big men. Mr. Hirst suggested that it would be a tremendous advantage if our system of education were carried out on such lines that an elementary schoolboy in Form 2 or 3 at Home might continue in Sydney, Calcutta or Johannesburg in Form 4 or 5. He would particularly like our universities to have such standards that a man in his four-year curriculum would spend two years of it in the overseas countries —Toronto, Melbourne or wherever else he might choose. If during their education men were sent to those vast territories where they were not hampered by tradition, where they would see the opportunities, the greatness of possibilities of development, they would create bigger minds and bigger men and bring us nearer to the Empire and the Empire nearer to us at Home. If this country or the British Empire with its 60 millions was to compete against America with 100 millions, and perhaps some day with reconstructed Central Empires, then we who were inferior in population must work with greater efficiency, which meant working in greater units. Working in greater units was the best weapon in the fight against nationalisation. In regard to companies having recently increased their capital and the big combinations and amalgamations which had taken place, this movement was not the mere will of the capitalist who wanted to push shares; it was only the outcome of the search for efficiency. The big work in the future would be done not by disjointed specialists, but we had to work together, and the specialists had to offer their services much more to the producer than in the past. Another important reason why these big amalgamations were to be recommended was that in order to work more efficiently we must better control our raw materials. The war had made the world short of raw materials. They must get out of paying many intermediate profits. It was only the big concerns that could find the means to reduce the prices from the real raw material to the finished product, and they would become more efficient by working with that aim in mind than if they continued in the old haphazard way. He had frequently heard little men grumbling that the big amalgamations or trusts were going to kill them. He was not of that opinion. He thought that the more these big enterprises undertook the more they would have to study, the more they would have to develop, and the more room would there be for little men specialists, little concerns, so long as they understood that they had got to work with the stream instead of against it. He had been particularly impressed by some six or seven men who were at present his guests in this country—their representatives from Australia, India, China, South Africa and other countries, who said that unless England at once delivered the goods, America would have it all its own way. They were all frightened of it. They all thought when told that we were building works and that we should be ready in a year or two or three, that it would be too late. Mr. Hirst said he was fully aware of what was called the American danger, but optimist as he always was, he was assured that if America booked all the orders there was a limit to what America could do, and its limits were fixed by natural laws. First of all by over-prosperity it would create its own troubles—we saw some of them already—but a country could not only be a creditor country. If America were to supply every country with its goods, every country would owe America money, and America had not the necessary purchasing capacity for trade in return. His opinion was that the exchange would so go down that it would pay other countries to give us a chance in three years' time. This was only a thought which he had not heard mentioned, but too many people seemed to be frightened the moment a bogey was raised. Mr. Hirst closed with a few words of encouragement. Never had there been such a chance for the electrical engineer as there was at present. He saw before him the development of electrification of railways and waterways, and of electrometallurgical and electrochemical industries, and he remembered the work done on the electric valve in connection with telephones and wireless during the war. There was a big catalogue of work to be done, and every Batti-Wallah ought to have at least £5,000 a year in five years' time.

Among the later speeches was one by General Sir Newton Moore, who had recently been on a visit to South America and the United States. He referred to the troubles with which America was faced, and emphasised the importance of our bringing down the cost of food. We paid 6½d. to Australia for beef which cost the consumer 2s. here. If we produced manufactures for export so that the food-carrying ships need not go out in ballast we could greatly reduce the cost of freight on incoming food.

THE "FUEL OF THE FUTURE" AND THE GAS COMPANIES.

So widely has the British Commercial Gas Association announced to the public that gas is the fuel of the future because it returns to the consumer some 70 or 80 per cent. of the actual heat value of the coal as gas, coke, or tar products, and so saves the nation's coal supply, while the electricity superstations will only give 20 per cent. of the heat value of the coal used, that it is necessary, for the safety of our coal supply, that everyone should be able to see clearly whether this is so or not.

The calculations necessary to do this are not very intricate, and once they are placed before the public should be easily understood. All the figures used have been supplied by the Gas Light & Coke Co., the South Metropolitan Gas Co., and the British Commercial Gas Association. The former only supplied figures under extreme pressure, and in some cases the figures are of doubtful reliability, while in others there is a distinct intention of avoiding the point, and to mislead. For instance, the obvious intention of the questions (2) and (3) below, is to find how much heat is wasted in the oven. The Gas Light & Coke Co., in their replies, endeavour to make it appear that no heat at all is wasted, but the statement of the amount of heat necessary to cook meat is entirely wrong. The amount of heat necessary is about 600 B.TH.U. per pound; the amount of heat developed by the gas used by the South Metropolitan in their very conservative estimate of 10 minutes at full heat (60 cu. ft. per hr.), and then a quarter of an hour for every pound at one-third, would give an average of over 3,000 B.TH.U. per pound for a 7-lb. joint, so that the Gas Light and Coke Co.'s figure does not even represent the actual heat passed into the oven. The figures spoken of as the British Commercial Gas Association's are taken from a lecture of Sir Dugald Clerk, which has been published by them for propaganda purposes.

The obvious intention of the advertisement is to delude readers into the belief that they are really obtaining as usable heat some 70 to 80 per cent. of the heat value of the coal; if this can be proved incorrect on their own figures, the gas companies have been convicted on the very best case they can put forward, and it is only a fair presumption that the case is really far worse, and that figures whose truth is doubtful have been doctored in the same way.

For the benefit of those who are not acquainted with the terms used in the science of heat, a few words of explanation of those whose use is unavoidable must be added. A British thermal unit (B.TH.U.), also spoken of as a heat unit, is the amount of heat necessary to raise one pound of water 1 deg. F., and is the standard by which heat is measured in this country. The calorific value of a substance is the amount of heat energy which it contains, and is given in B.TH.U. It is also useful to know that four pints of water weigh five pounds, and therefore require 5 B.TH.U. to raise them 1 deg. F.; or if the water were at 40 deg. F., they would require 860 B.TH.U. to boil.

Questions submitted to the British Commercial Gas Association and forwarded by them to the Gas Light & Coke Co., and their answers with annotations from the South Metropolitan and British Commercial Gas Association, here follow.

Questions.	Gas Light & Coke Co.
(1) What is the calorific value of gas?	480 B.TH.U. per cu. foot.
(2) What is the estimated amount of heat required to roast a 7-lb. joint?	From 1,000 to 1,500 B.TH.U. per lb.
(3) What is the actual consumption in cu. ft. of an oven in cooking a 7-lb. joint?	Divide B.TH.U. required by 480. This gives consumption in cu. ft.
	South Metropolitan. 10 min. at 60 cu. ft. per hr. 1¾ hr. at 20 per hr.
	British Commercial Gas Association. When coal is converted to gas 25 heat units per 100 in coal becomes gas. For every hundred heat units employed at the gas works 3.4 can be applied in the oven.
(4) What is the amount of gas required to boil a 4-pt. kettle if the water is 40 deg. F.?	From 3½ to 4 cu. ft.
(5) What is the amount of coke necessary to boil 20 gall. of water from 40 deg. F.?	4.8 lb.
(6) What is the amount of coal gas which is obtained from 1 ton of coal?	Not answered.
(7) What is its calorific value?	Not answered.
(8) What is the calorific value of coal used?	13,000 B.TH.U. per lb.
(9) What is the amount of mixed gas delivered to the public for every ton of coal destroyed?	15,000 cu. ft.
(10) What is its calorific value?	480 B.TH.U. per cu. ft.
(11) What is the amount of coke obtained from one ton of coal?	8 cwt.
(12) What is its calorific value?	12,000 B.TH.U. per lb. (between 10,000 and 11,000).

The replies to questions 9 and 11 are stated by the Gas Light and Coke Co. to be fair figures when taken in combination. The neglect to answer questions 6 and 7 is easily understood. In the first place, it would have allowed a check to be made on the calorific value of the mixed gas, and secondly, it would have given away the amount of gas which was added. The gas added is called water gas, and this contains about 30 per cent. of carbon monoxide, which is deadly poison, in addition to the 6 per cent. which is already contained in the coal gas, so that if equal quantities of the coal gas are taken, 18 per cent. of the gas delivered to the consumer is a deadly poison; but really it doesn't matter, as your death is not likely to be attributed to the gas in your oven, particularly while the gas companies keep mum.

If it is assumed that a gas company has a ton of coal to convert into gas, it will be seen that 3.4 cwt. of coke are required for heating it, and this can only be obtained as the result of former conversions. It is necessary to find how much coal has been destroyed to make this 4 cwt. of coke, and also how much gas has been obtained, so that due allowance can be made. It can be assumed that 1¾ oz. of coke and 8¾ oz. of coal fell to earth from one of the planets, thus saving our national supply, and were picked up by an enterprising individual, who commenced the manufacture of gas. He used the 1¾ oz. of coke to heat the 8¾ oz. of coal, and obtained, as a result, 3½ oz. of coke and 3.666211 cu. ft. of gas. He then purchased 17½ oz. of coal and heated that with the 3½ oz. of coke. From this operation he obtained 7 oz. of coke and 7.442422 cu. ft. of gas. He continued operations till he found that, as the result of one baking, he had 4 cwt. of coke, and he had then stored up 15,000 cu. ft. of gas—while he had used one ton of coal. He

now proceeds to take a ton of coal, and receives 15,000 cu. ft. of gas, and 8 cwt. of coke, so that having destroyed 2 tons of coal, he has, in their place, 30,000 cu. ft. of gas, and 8 cwt. of coke. Unfortunately, the whole of this coke is not available to the public, as about one-third must be kept in hand for future bakings. Thus there is available to the public only 30,000 cu. ft. of gas and 600 lb. of coke, which represents, in heat units, 14,400,000 B.TH.U. in the gas. Over the value of the coke there is a difference of opinion between the two largest makers, but it is unnecessary to take advantage of this, and the mean (11,000 B.TH.U. per lb.) will be taken. The coke then is equal to 6,600,000 heat units. The coal is equivalent to 13,000 B.TH.U. per lb., so the destruction of two tons means the destruction, or conversion, of 58,240,000 heat units. If only 21,000,000 are obtained from this, it is obvious that even before the gas and coke leave the gas works, there is only 36 per cent. of the original heat value left instead of 70 or 80 per cent.

The gas company having lost some 64 per cent. of the heat, it is now the turn of the consumer to lose still more. It will be seen from the questions and answers above that Sir Dugald Clerk says that for every 100 heat units employed at the gas works, 3.4 can be applied in an oven. He has already said that every 100 heat units at the gas works produces gas containing 25 heat units, so that this statement means that, if gas containing 25 heat units is burnt in an oven, 3.4 units are usefully employed, the remainder going up the flue and being wasted in other ways. In other words, the oven has an efficiency of 13.6 per cent.

To boil four pints of water from 40 deg. F. requires 860 heat units, or, if allowance is made for the kettle, 900 heat units. The Gas Light & Coke Co. say 3½ to 4 cu. ft. are necessary, which, taking their value for gas, means from 1,680 to 1,920 heat units. The average being 1,800, it will be seen that half the heat is wasted, or the gas ring has an efficiency of 50 per cent.

In practice, about the same amount of gas is burned in the oven as in the gas rings, so that for every 100 cu. ft. passing through the meter, 50 go to the oven, and of these 6.8 are usefully employed, while 50 go to the boiling rings, and of these 25 are usefully employed. That is, the gas can be burned with an average efficiency of 31.8 per cent. This being the case, the 14,400,000 heat units contained in the gas are only equal to 4,579,200 heat units efficiently applied.

A coke boiler can be used according to the Gas Light & Coke Co. with an efficiency of 60 per cent.; if that is correct the 6,600,000 heat units in the available coke are equal to 3,960,000 heat units efficiently applied.

In all, then, the destruction of coal worth 58,240,000 heat units has enabled 8,539,200 to be used. That is, the 70 or 80 per cent. promised to the consumer has dwindled down to 14.66 per cent. when put to practical use. Even this figure, low though it is, does not represent anything like the worst, and probably real, figure. It has been assumed throughout that the whole of the gas companies' products are utilised, but to pretend that any large increase in the use of gas would mean a corresponding increase in the use of coke, is merely to imitate the ostrich, and bury one's head in the sand.

The consideration of the tar products has not been undertaken, because they only contain 5 per cent. of the original heat, and only a very small proportion of them are used, or can be used, for that purpose, nor are any figures available as to the efficiency with which they can be used. Further, the tar oil has a lower calorific value than the mineral oil, and therefore a lower efficiency. The tar products are: Benzine and its homologues, from which the aniline dyestuffs are obtained, carbolic acid and picric acid, naphthalene and pitch, so that it can be seen that the amount of heat used as heat contained in these is negligible.

The gas companies say that the maximum efficiency to be obtained from the electricity superstations is 20 per cent. Accepting this figure, from 58,240,000 heat units contained in two tons of coal, 11,648,000 would be passed along the wires to the consumer.

An electric oven uses from 90 to 95 per cent. of the heat passed into it, not wasting more than from 5 to 10 per cent. Electric kettles, saucepans, &c., have an efficiency of about 97 per cent., the only loss being that of radiation, which is unavoidable by any method of heating. If an average efficiency of 90 per cent. is assumed, it will be well within the mark. Thus the 11,648,000 heat units are equivalent to 10,843,200 efficient heat units, or 18 per cent. of the original heat value of the coal.

It is evident, then, that if only 14.66 per cent. is the greatest amount that we can use of the heat in the coal that the gas companies destroy, against the 18 per cent., a very low estimate, which we get when using the products of the electricity companies, every 5d. paid to the gas companies for gas at a price of 4s. 2d. per 1,000 cu. ft. means a loss to the national coal supply of 5 lb. of coal.

THE ELECTRICAL CONTRACTORS' ASSOCIATION (INC.).

On Wednesday last week, at the Imperial Restaurant, Regent Street, S.W., the Electrical Contractors' Association (Incorporated), the N.E.C.T.A., Ltd., and the National Federated Electrical Association held their first annual dinner since the outbreak of war. The president, Mr. H. J. Cash, was in the chair, and in addition to members and their friends, there were present representatives of many other branches of the electrical industry, including Mr. C. H. Wordingham, C.B.E., past-president, and Mr. Roger T. Smith, president of the Institution of Electrical Engineers, Messrs. Ll. B. Atkinson, J. S. Highfield, P. F. Rowell, A. P. Trotter, A. C. Cramb, H. G. Purchase, M.P., R. Tweedy Smith, E. G. Wansbrough, T. Roles, L. Gaster, J. W. Beauchamp, and F. B. O. Hawes. Amongst the members present were Messrs. R. G. Tyler, S. H. Webb, W. Cross, and A. E. Chesters, and Mr. L. G. Tate (general secretary).

After the loyal toast, put by the chairman, Mr. Wansbrough proposed "The Allied Associations and Honorary Officials," conveying fraternal greetings from the Cablemakers' Association, and congratulating the associations on the power and influence which they had so quickly attained. Mr. Tweedy Smith, the first honorary Fellow of the Association, in his reply, identified the N.E.C.T.A., the N.F.E.A., and the E.C.A. respectively with the body, soul, and spirit of the electrical installation industry; he pointed out that the E.C.A. had in a very few years done away with the old spirit of trade jealousy which prevailed before its inception, the N.E.C.T.A. had shortened the distance from the manufacturer to the consumer and fostered goodwill between manufacturer and contractor, and the N.F.E.A. was developing a spirit of comradeship between employer and employé.

Mr. Cross, proposing "The Guests," advocated closer co-operation between the various electrical associations, and welcomed the broader views with regard to the functions of the Institution of Electrical Engineers which had prevailed in recent years, especially under Mr. Wordingham; it had taken a more prominent part in the commercial and practical side of the industry, to the great benefit of the latter. The Illuminating Engineers' Society had been of great assistance to contractors; the I.M.E.A. and the Associated Supply Co.'s would find the contractors useful to them as unpaid canvassers and in negotiations with consumers, the B.E.A.M.A., if it would give contractors better terms than consumers, would command their cordial support; the Cablemakers' Association had done good work in maintaining the quality of British cables, and the new plan of designating cables by sectional areas was very welcome, while the statement of prices per 1,000 yd. instead of per mile would save a vast amount of calculation; and lastly, the E.D.A., the baby association of the industry, would do good work in advertising the advantages of electricity. In his reply, Mr. Roger T. Smith said that it would take a long time to return to normal conditions, but he had noticed that sport was imme-

diately resumed where it left off; the sportsmanship of our soldiers had won the war, and he was certain that they could count on the sportsmanship of the workers, provided that the employers were sportsmen too. Mr. J. W. Beauchamp also replied, and said that he had been greatly impressed by the unity and the influence of the Association. The contractor sold "outlets," which were indispensable to the supply man; he had worked both with and without trading powers, and while in the early days these were necessary, that was not the case to-day, provided that the contractors would carry on the work of development unchecked.

Mr. Cash, proposing "The Electrical Trades Benevolent Institution," of which he was president, explained the objects of the institution, and commended them to the audience, suggesting that members of their staffs should be urged to join as members. As a guide to the amount of subscriptions, he proposed that they should think of a number, add 10s. 9d. or 21s. 6d., multiply by 53, and divide by 47, and add 12½ per cent. war bonus! Mr. Hawes, secretary of the E.T.B.I., in reply, referred to the exceptional abilities of the president, backed by the Association, to secure a good list of subscriptions, and exhorted the guests to support the festival, besides obtaining new members. Mr. S. H. Webb proposed the health of the chairman in eulogistic terms, and referred also to the valuable work done by his predecessors, Messrs. W. Cross and Rawlings; the toast received musical honours, and the chairman briefly acknowledged the compliment.

An entertainment was provided under the direction of Mr. E. Halford, and the function was thoroughly successful and enjoyable.

ELECTRIC VEHICLES AT SHEFFIELD.

Sheffield Corporation has had under consideration a scheme for the utilisation of electric vehicles for the collection of house refuse. We abstract below Mr. J. A. Priestley's (superintendent, cleansing department) report on the matter to the Health Committee, which has been adopted by the City Council, and from which it will be seen that the estimated expenditure is about £100,000.

The present condition of arrears in the collection of house refuse in the city, and the rearrangements necessary in the organisation of the department consequent upon the establishment of the 47-hour working week, make this an opportune moment for considering the future policy of the department in relation to equipment for the collection and disposal of house refuse. The existing congestion has been brought about by a number of contributary causes, some of which conditions are not likely to recur, and the advent of warmer weather and consequent reduction in the amount of refuse to be collected will improve the situation during the summer, but next winter will see a recurrence of the trouble unless steps are now taken to put the department in a position to cope at once, and thoroughly as it arises, with the extra work which the winter season entails. It is as yet impossible to speak definitely of the effect of the 47-hours' week, but on the present basis it would require an addition of four motors or 12 horses and wagons.

The renewal of privy conversion work will also necessitate additional equipment, and for two reasons. The cleansing of privies requires the loading of refuse from the street into the wagons, and a load can be filled in a comparatively short time, whilst in bin refuse collection the material is carried out and loaded direct into the wagons, which have to travel from house to house and wait for both collection and loading of the refuse. The result is that the ratio between privy refuse and bin refuse collection is about as 5 to 3, and allowing for the reduction of material to be moved, the conversions will require an increase of 25 per cent. in the vehicles employed on the work. At present privy cleansing work is done at night, and almost entirely by electric motors, which are used both on day and night shifts. Bin collection is done by day only, and for many reasons it is considered that this practice should not be altered. The effect of conversion will be to reduce night work, and to prevent the use of motors on two shifts, and additional motors or horses will be required, corresponding to the night work discontinued plus 25 per cent. As seven motors and seven horses are now employed on privy cleansing work, the completion of conversions will necessitate at least an additional eleven motors to meet this change over.

It has been practically impossible during the war to increase equipment, the result being that the present equipment is only equal to ordinary conditions, and there is not sufficient elasticity to deal with pressure periods.

The experience of the past four years with electric motors in the collection of house refuse has been eminently satisfactory, and has demonstrated that the work can be done by their agency more expeditiously and economically than by horse labour. For house-to-house collection work the electric vehicle cannot be approached by petrol motors. Steam wagons approach more nearly to the electrics in suitability and economy for this work, but the latter possess advantages in noiselessness and ease of manœuvring that are not shared by steam wagons, and require also the services of one man only, and he not necessarily a skilled man, to drive them.

Since electric vehicles were introduced in Sheffield the fleet has been added to so as to compensate for the wearing out of the horses engaged on refuse collection, but no surplus vehicles have been obtained. With greater facilities for obtaining delivery of motor vehicles, it is desirable that the policy of the department should now proceed on settled lines, and that horses should be replaced as rapidly as possible by electric vehicles. To collect the total quantity of refuse by electrics will require about 60 vehicles, or allowing a 10 per cent. margin to cover breakdowns, 66 vehicles would be necessary. There are at present 12 vehicles in use and three on order, and the full programme would therefore require the provision of 51 additional machines. Garage accommodation is available for the existing vehicles, and by conversion of stables not now fully occupied provision can be made for a small number of additional machines, but the garaging of 60 to 70 vehicles will necessitate the erection of a properly designed and equipped building for this purpose, a suitable site for which is available. For charging the batteries of this number of vehicles three 100-kw. motor generators would be required in addition to the present charging facilities, and as a stand-by machine is imperative, four generators of this capacity should be provided. Charging panels, switchboards, measuring instruments, &c., would also be required in proportion to the vehicles, and it is estimated that the total cost of the equipment as described would be about £100,000.

The process of substitution should proceed regularly and systematically, but could be spread over a period, which, having regard to the age and condition of the major number of the horses, should not be longer than six years.

THE I.E.E. VISIT TO HOLLAND.

At the invitation of the Society of Directors of Electricity Works in the Netherlands, of which Mr. J. G. Bellaar Spruyt is president, a deputation representing the Institution of Electrical Engineers visited Holland from the 21st to the 28th of September.

The deputation comprised Mr. C. H. Wordingham, C.B.E. (president), Mr. Ll. B. Atkinson, Mr. G. Balfour, M.P., Sir T. O. Callender, Mr. B. Drake, Mr. W. W. Lackie, C.B.E., Dr. E. W. Marchant, Mr. C. P. Sparks, Mr. W. B. Woodhouse, and Mr. P. F. Rowell (secretary), and was accompanied by Mr. G. H. Parr, of the Department of Overseas Trade.

The visit was of great interest to all members of the deputation, and owing to the kindness of their hosts and the excellent arrangements made, a very large part of the country was seen, numerous electrical and other works were visited, and matters of more than engineering interest were discussed.

The rapid progress of electrical undertakings in Holland is facilitated by the existence of a standard frequency of 50 cycles. Each province has a supply of electricity distributed by overhead lines. Compulsory wayleave powers have facilitated this method. All generating stations are or are being interconnected. The development throughout the country embraces not only the towns and manufacturing industries, but also the rural districts, where electric pumps are superseding windmills.

From the point of view of coal supply, fuel, economy and increase of output will make Holland practically self-supporting, in spite of the fact that the industrial undertakings are now paying ten times as much for coal as they did before the war.

Dutch electrical engineers relied in pre-war days upon German machinery for their stations, though a considerable amount of British cables has been laid. During the war, however, the Dutch "Stork" Co., in collaboration with Brown Boveri, of Switzerland, has produced very satisfactory turbo-sets, whilst other firms are specialising in small plant such as motors. The Dutch cable factory at Amsterdam appears at present to be supplying only smaller wires for internal installations, &c.

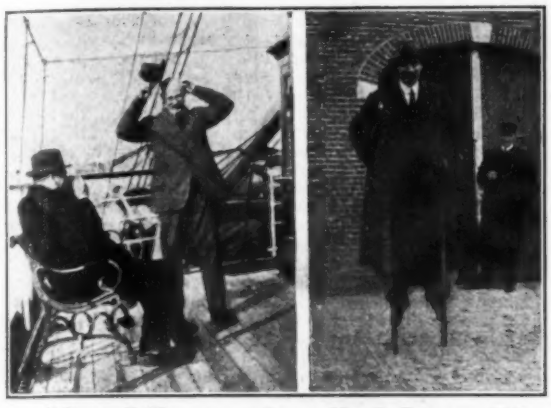
The low rate of exchange of the mark is enabling Dutch buyers to obtain much more favourable prices from German manufacturers than from our own, and at present this difference may even amount to 20 per cent. As far as quick deliveries are concerned, British manufacturers could probably get the orders; particularly if they could state their price c.i.f. at a Dutch port.

The general impression gained by manufacturers who took part in the visit was that it would probably be a wise policy to endeavour to set apart some proportion of their manufacturing facilities to supply the Dutch market, and create a position there at a time when the conditions are more favourable for doing so than they ever have been in the past, or possibly are likely to be in the future.

In Amsterdam electricity works three-phase current is generated at a pressure of 10,000 volts by means of steam turbines and water-tube boilers. Further extensions are in progress, and the deputation was much interested in the details of construction and operation of the station.

Particulars of the extraordinary development of electricity supply in Amsterdam were furnished by Dr. Lulofs. Out of 140,000 houses, 110,000 are provided with electric light. In pre-war days only 30,000 were connected. Additional connections are being made at the rate of 500 a month.

At a dinner at the Hague, Mr. H. Doijer, president of the electrical section of the Royal Institute of Engineers, in summarising a comparison of our business methods with those of Germany, pointed out that among the electrical machinery in Holland, English articles played an unimportant part, 80 or 90 per cent. being of German or Swiss origin. He said: "Your tendency to good workmanship of electrical articles is on an average more pronounced than that of the German and Swiss firms, but their policy of manufacturing in large quantities is superior to yours, which makes their products less expensive. Your knowledge of electrical materials is more profound than that of your competitors, but their faculty and facility to calculate is more at the fingers' ends of their average man, enabling them, with all the dangers attached to it, to approach nearer to the minimum allowable dimensions of material, which makes their articles again a little cheaper. Your insight into the difficult electrical engineering problems is in my opinion superior to theirs, but their organisation to introduce their products over here is certainly



"Cables" (Overheated!) Mr. G. Balfour, M.P., on Stilts!

more systematised than yours. To express it in a few words, you excel in the character of the individual, your competitors excel in the organisation of the masses. And to finish up, did not they induce our young electrical engineers to live with them in Germany and Switzerland in their factories and offices, inspiring them after a few years to return to Holland, imbued more or less with their interpretation of electrical problems? . . . If you want to improve in your favour the balance of imported electrical articles among the countries surrounding Holland, you will be perfectly welcome, and you will have our best wishes."

Various public and private works in Amsterdam were visited, as well as the Hague, Scheveningen, the State coal

Mr. C. P. Sparks Map-reading.

mine "Emma," Groningen and Zoutkamp, and at Apeldoorn the deputation was received at Het Loo by the Queen and her consort.

The present output of the Dutch coalfield is four million tons a year, of which approximately one-half is produced by the State mines, the other half by private enterprise. It is anticipated that in the near future some eight million tons will be produced. During the war a neighbouring deposit of lignite was utilised for power production, and this was still in use.

The central station at Groningen supplies the town and the province, and in addition supplies in bulk the province of Friesland. Transmission, as elsewhere, is at 10,000 volts by means of overhead cables, but a 50,000-volt line is in course of construction. Distribution is at 3,000 volts and 380 volts, the neat design of the overhead distribution being particularly noteworthy. The electric railway from Rotterdam to the Hague is an example of the high-pressure A.C. system, the overhead contact wires being at a pressure of 10,000 volts.

Summarising the impression gained, it appears that the rapid development of electricity supply will call for considerable extension of the generating stations and transmission systems, in which British manufacturers should take their part. The development of electrical manufacturing undertakings in the country is growing, but apparently not so rapidly as the demand for plant.

The extensive distribution in rural districts by means of overhead lines is made possible by the lenient regulations as to the method of construction, and by the compulsory wayleave powers possessed by the supply authorities.

Electric power supply is placed in an advantageous position by the high price of fuel; the national resources of coal are not great, and peat, though extensively used domestically, is of little present value for power purposes.

Everywhere was evidence of the closest co-operation between the supply authorities, companies, municipalities, and provincial authorities and in industries associated with agriculture.

Mr. Wordingham (to whom we are indebted for the accompanying "snapshots") summed up the matter in his concluding speech at Groningen in the words, "Co-operation is the keynote of the country."

THE INTERNATIONAL ELECTROTECHNICAL COMMISSION.

The International Electrotechnical Commission has not held any meetings during the war, although it has successfully maintained its central organisation intact. Now that peace has come again, reconstruction is occupying its attention, and in order to make quick progress, in spite of the difficulties of transport, it was decided to hold a meeting in London. This meeting was opened on Monday last at the Institution of Civil Engineers, Great George Street, S.W. 1, by M. Maurice Leblanc, the president of the Commission, 18 countries being represented by some 52 delegates.

Sir Richard Glazebrook, C.B., in welcoming the foreign delegates on behalf of the British National Committee of the

Monsieur Maurice Leblanc,
President of the International Electrotechnical Commission.

Commission (of which he is president), regretted the fact that Mr. A. J. Balfour, who had addressed the delegates in 1908, was unfortunately unable to be present on this occasion; he had, however, written expressing the keenest interest in the work, and it was Sir Richard Glazebrook's hope that he might yet be with the delegates before the close of their meetings.

Sir Richard Glazebrook then referred to the pioneer work in electrical standardisation carried out by the Electrical Standards Committee of the British Association, of which for many years he had acted as secretary. This work had been international in its character, and had laid the foundation for the industrial superstructure which the Commission was now endeavouring to complete. In Great Britain the British Engineering Standards Association was responsible for elec-

trical standardisation, and overlapping of effort was entirely avoided by the fact that the Sectional Electrical Committee of the Association was, *ipso facto*, the British section of the International Commission.

Mr. Roger Smith, president of the Institution of Electrical Engineers, also extended a very hearty welcome to the foreign delegates, and Mr. A. R. Everest, on behalf of the British Electrical and Allied Manufacturers' Association, joined with the previous speakers in offering the industry's cordial greeting to the eminent electrical engineers present. The general secretary, Mr. C. le Maistre, read a letter from Col. Crompton expressing his great regret at his unavoidable absence.

The president of the Commission, M. Maurice Leblanc, then gave an interesting address, in the course of which he referred to the fact that the Commission owed its inception to the Chamber of Delegates at the St. Louis Congress in 1904, at which Col. R. E. Crompton, C.B., had initiated the movement. He mentioned the fact that the late Lord Kelvin had been the first president, and referred to the losses which the world of science and electrotechnics had sustained through the passing away of Dr. Silvanus Thompson, F.R.S., Prof. Gerard, of Belgium, Mr. W. Duddell, F.R.S., Prof. Jona, of Italy, and Mr. Von Krogh, of Norway. He paid a solemn tribute to the memory of the great men who had laid down their lives during the war—not only at the front. In the interval since 1913, he said, Mr. le Maistre had done invaluable work in keeping the Commission together.

He also spoke of the great problems of reconstruction which lay before the electrical industry of the world, and mentioned the surprise it had been to him to realise how quickly his beloved country, France, had, during the war, become a national workshop; he felt sure that they would be able to turn the experience they had gained through the manufacture of munitions to the manufacture of the engineering appliances required in everyday life. Intensive production must be continued, and must be regulated by the State in the interest of the community. Altruism must take the place of egotism. He referred to the tremendous sacrifices which had been made by the allied nations to obtain the great victory, and hoped that in the future those who had suffered would, in some proportion, obtain the freedom and better conditions for which they had fought. He wished the Commission every success in the work which lay before it, the most important item of which was the establishment of an agreed basis for the comparative rating of electrical machinery and apparatus.

Mr. C. H. Wordingham, C.B.E., the immediate past-president of the Institution of Electrical Engineers, replied to the address, and expressed the pleasure they all felt at having as their president an honorary member of that Institution. He remarked that while the allied nations had suffered most grievously in the war, the neutral nations, a number of which were represented at that meeting, had also suffered very severely. He felt sure that the glorious nation of which the president was the honoured representative would be unsurpassed in the period of reconstruction as it had been unsurpassed in the war.

Signor Guido Semenza, past-president of the Italian Association of Electrical Engineers, and one of the founders of the Commission, in thanking the British Committee for its welcome, expressed on behalf of the foreign delegates the pleasure it was to them all to be present, and to take part in what he felt was work of immense importance to the future welfare of the electrical industry of the world.

Dr. C. O. Mailloux, president of the United States Committee, who through his linguistic ability had from the very inception of the Commission been of the greatest service to the movement, acted as interpreter during the proceedings, and at the close of the sitting, on behalf of the American delegation, suggested that the next meeting of the Commission should be held in the United States of America, where he knew the delegates would be certain of receiving a very hearty welcome.

Monsieur Brylinski, president of the French Committee, supported Dr. Mailloux's suggestion, and at the plenary meeting held on Wednesday this proposal was considered.

The following is the list of delegates present at the meeting:

Australia: Mr. G. H. Knibbs, C.M.G.
Belgium: M. E. Gevaert, M. le Prof. A. Halleux.
Brazil: M. M. de Oliveira.
Canada: Mr. A. P. Trotter.
Chile: Eng. Com. Don Roman Suarez, Eng. Lt. Migueles.
Denmark: Prof. Absalon Larsen.
France: M. E. Brylinski, M. P. Boucherot, and M. David.
Great Britain: Sir Richard Glazebrook, C.B., Mr. F. M. Chapman, Mr. J. E. Edgecombe, Mr. A. R. Everest, Mr. C. Rodgers, Dr. A. Russell, Capt. H. R. Sankey, C.B., R.E., Mr. C. P. Sparks, Capt. J. Slee, R.N., Sir Wm. Slingo, Mr. R. T. Smith, Mr. A. J. Stubbs, Mr. C. H. Wordingham, C.B.E.
Holland: M. Barnet Lyon, M. le Dr. de Haas.
India: Mr. Maurice G. Simpson.
Italy: Signor Guido Semenza, Prof. Morelli.
Japan: Mr. Motosuke Kasuda, Mr. Motoo Uchisaka.
Mexico: Senor Ing. D. Arturo Pani.
Norway: Eng. J. C. Holst.
Poland: M. Czainomski.
Portugal: Col. J. Lucas, Mr. E. S. Lane.
Switzerland: Mr. Huber-Stockar, Mr. A. de Montmollin.
United States of America: Dr. C. O. Mailloux, Messrs. Burke, Hobart, Chubb, and Kemble.

The following members of the British National Committee were also present:—

Lieut.-Col. Robertson, R.E., Mr. J. H. Bowden, Mr. W. McClelland, Prof. T. Mather, Mr. W. M. Mordey, Mr. G. Scott Ram, Mr. W. R. Rawlings, and Mr. P. F. Rowell.

On Tuesday evening the members of the Commission were entertained at dinner by the president and members of the British National Committee of the I.E.C., the president and Council of the Institution of Electrical Engineers, and the chairman and Council of the British Electrical and Allied Manufacturers' Association at the Connaught Rooms. Sir Richard Glazebrook occupied the chair, and was supported by many distinguished members of the electrical industry.

After the toast of "The King" had been honoured, the Chairman proposed the health of "The Rulers of the Nations Represented," making a special reference to the illness of President Wilson. He then outlined the history of the Commission from the beginning, pointing out that the British Engineering Standards Committee under the guidance of Sir John Wolfe Barry had laid the foundation upon which the Commission was based, when Colonel Crompton, the real father of the I.E.C., brought the work of the committee before the Congress at St. Louis. In 1908 the Commission was welcomed by Mr. A. J. Balfour with wise words of encouragement. It received Government recognition at Turin in 1911, and at the meeting in Berlin in 1913 valuable work was accomplished, which was now being completed. The Commission's work on copper had been approved throughout the world. Its work on nomenclature was practically complete, and the report on symbols was to be approved on Wednesday. The rating of machinery was a very great task, and was only partially completed as yet, but the greatest achievement of the Association was to draw together representatives of 20 nations, all imbued with the same purpose, to place at the service of mankind the great advances which had been made in electrical science. The international Commission's work was to deal with great principles; the work of the national committees was to apply those principles to the preparation of specifications in accordance with local conditions.

At the request of Sir Richard Glazebrook, Mr. A. J. Balfour then delivered an address of welcome to the delegates, in the course of which he pointed out that standardisation would greatly diminish the waste of brains and material, but care must be taken lest originality be hampered by the adoption of too rigid regulations. By increasing the efficiency of human industry they would increase production and do more for the benefit of mankind than those who disputed in the Press and in Parliament. He heartily congratulated the Commission on the success of their meeting. The address was responded to by M. Leblanc, Signor Semenza, M. Brylinski, and M. Huber-Stockar.

Called upon by the Chairman, Col. Crompton said that the aim of the Commission was to undo the "shell-shock" of the Tower of Babel, by which the peoples of the world were disunited; the work of the I.E.C. rested on the good fellowship of those who had the common object of pooling their efforts for the common good. The greatest happiness of an old man like himself was to look back and feel that he had been the means of doing good to others and that when he was gone he would be regretted.

Mr. Mailloux paid an eloquent tribute to Mr. Balfour, acknowledging the inspiration that he had received from his words not only in 1908 and 1919, but also when he made a great speech in New York in 1916. He also eulogised the merits of Sir Richard Glazebrook and Col. Crompton, and the latter, in proposing that the thanks of the assembly should be accorded to Sir Richard for presiding, took the opportunity of acknowledging the invaluable work that had been done by the indefatigable general secretary, Mr. C. le Maistre, and his devoted staff.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Labour Conditions in South Africa.

Having been advised to leave England, I am writing in the hope that some of your readers may be able to advise me on one or two points which I should like cleared up before I take the "final plunge." My choice has turned to South Africa, as I have friends there, but what I want to know, primarily, is this: What is the labour situation like out there, with special reference to electrical engineering? I have had a good technical training, and my practical experience covers over eight years, embracing meters and electrical measuring instruments of all kinds, charge of generating and converting plant, wiring and general installation work, wireless telegraphy, cables, magnetos, &c. At the present moment I am with a large firm of electrical engineers. Were I single, I should simply go and take my chance, but I am married, and do not want to take any unnecessary risks. Failing South Africa, could any of your readers tell me anything about the other British possessions, or the proper quarter to write to? I am a public school man, and I also possess a little capital.

O. M. T.

TRADE IN AUSTRALIA.

Electrical and allied manufacturers will be interested in the following summary of conditions in the Australian market. It is based upon a report on the trade of Australia written by His Majesty's Senior Trade Commissioner in Australia (Mr. S. W. B. McGregor), and issued by the Department of Overseas Trade.

General Prospects. The natural resources and potential wealth of Australia are so vast, and her people so virile and enterprising, that it is only reasonable that with the development of her resources and expansion of population, manufacturing industries on a large scale should be successfully carried on. Concurrently with the growing prosperity of Australia and the development of her manufacturing industries, British manufacturers, for many years to come, may confidently look forward to increasing trade with Australia.

Public Works. The necessity for financial economy, together with the scarcity and high cost of imported material, led last year to the suspension or delay of all public works of any importance. Progress in the electrification of the Melbourne suburban lines has again been hampered owing to the delay in obtaining parts of the plant, but it is anticipated that the greater part of the system is now in operation.

Electrical Commission. An Act (No. 2,996, January 7th, 1919) has been passed by the Victorian Government relating to the constitution of a body of electrical commissioners. Amongst the functions of the commissioners is the preparation of a scheme, with plans, specifications, and estimates, for a coal mining and electrical undertaking to be undertaken by them at Morwell, and the distribution of electricity therefrom; to prepare a report on the relative practicability of utilising water power for electrical undertakings; and to report on the ultimate co-ordination or unification of all State or other electrical undertakings in Victoria. The three commissioners authorised by the Act have been appointed.

Hydro-electric Developments. In Victoria, the most important project is the conservation and utilisation of the water resources of the Bogong High Plains in connection with the Kiewa river. The power station would be about 136 miles from Melbourne, and is expected to supply, approximately, 30,000 kw. of electric energy continuously. This scheme, together with the possibilities of hydroelectric development in the whole of Victoria, is to be considered and reported on by the Electricity Commissioners. In Tasmania, the Hydroelectric Department of the Tasmanian Government continued general extension work. The estimates for 1918-19 provide for the expenditure of £127,150, which will furnish 42,000 h.p. at the power house. The estimated working expenses for the same period are £26,500, and the revenue £57,000. The capital expenditure to June 30th, 1918, was £643,281. The total electrical units sold during 1917-18 were 14,256,000. The supply of power to the Electrolytic Zinc Co. was increased from 2,500 h.p. to 4,000 h.p. The difficulty which the Hydroelectric Power & Metallurgical Co., Ltd., experienced with their carbide electrodes is being overcome. Their present requirements are from 3,000-4,000 h.p., and they have given notice of their requirement for 6,500 h.p. of additional power. The further development of the hydro-electric resources of Tasmania will, it is believed, lead to the creation of a number of industries for which cheap electrical power is necessary, and generally to a great increase in the prosperity of that State.

Development of the Brown Coal Deposits. The development of the immense brown coal deposits at Morwell, about 80 miles east of Melbourne, appears likely to be actively proceeded with by the Victorian State Government. The carrying out of this project, which is estimated to cost, in the first instance, about £1,855,000, provides for the bulk supply of cheap electric current, as well as the manufacture of briquettes, together with by-products, and it would be of the greatest benefit to Melbourne and the State of Victoria as a whole. The full extent of the coalfield is not known, but from borings made in the Morwell-Traralgon area it appears likely that 100 square miles could be selected wherein the thickness of coal averages quite 250 ft., and the quantity amounts to 20,000,000,000 tons. The proposal is to erect an electric generating plant at Morwell with a capacity of 50,000 kw. to commence with. It is estimated that 100,000 kw. will be required by the year 1925. It is anticipated that the cost of electric current to existing undertakings in Melbourne would be about 0.326d. per unit. The cost of the coal delivered to the power house is estimated at 2s. 3d. per ton. The removal of the overburden and the mining of the coal is proposed to be effected by means of mechanical shovels.

Engineering Standardisation. The question of engineering standardisation in Australia has been under consideration. A number of meetings and conferences have been held, and it is hoped that some such body as the Australian Engineering Standards Association will shortly be formed, representative of each State, of the interests involved and acting in co-operation with the British Engineering Standards Association in London.

Growth of Local Manufacture. Generally, in regard to engineering and machinery, there are a number of engineering works in Australia of varying size and importance, and during the war period they have constructed a quantity of machinery formerly imported. On the whole, the design and workmanship of such machinery has been of a high order. It is obvious, however, that, with some exceptions, Australian engineering firms cannot at present compete with British firms adopting standardisation and mass production; but, at the same time, British engineering firms should give consideration to the extent to which they could advantageously co-operate with Australian firms in the production of certain classes of machinery.

In regard to the production of iron and steel, considerable progress has been made. The Newcastle Steel Works of the Broken Hill Proprietary Co., Ltd., has had a successful year's working, and has now an output of 250,000 tons of pig iron per annum. The open hearth steel furnaces have an annual capacity of 168,000 tons, the steel being of exceptionally good quality. The rail mills are capable of an output of 1,000 tons of finished rails per day. The rod mill has been completed and has a capacity of 250 to 400 tons per week. The production of steel plates has, on the whole, proved disappointing. These are the only steel works of importance in Australia, and although these works will undoubtedly be extended, it is felt that it will be many years before the total and varied demands for steel can be produced in Australia. The Broken Hill Proprietary Co., Ltd., have been able to meet local requirements in respect of steel rails, other than tram-rails.

Negotiations are proceeding, or in some cases completed, for the erection of works for producing galvanisd iron sheets, tin plates, fencing wire, wire ropes, and steel pipes.

Queensland possesses vast deposits of iron ore and coal. The State Government is considering the development of these deposits, and the erection of a steel works, probably at Gladstone.

Considerable progress has been made in the manufacture of railway tires and axles, and a firm in Castlemaine, Victoria, have put down a tire rolling plant, constructed in their own works. It is probable, however, that tires and axles for locomotives and fast passenger traffic will be imported for some time to come.

Works have been successfully established for the manufacture of brass and copper wire, tubes, and sheets, also for the manufacture of brass and iron fittings of various kinds.

There has been considerable expansion in the manufacture of machinery of all kinds. Whilst Australia cannot possibly compete in price with countries manufacturing machines on quantity production lines, yet there is ample scope for development in many directions.

Imports of Electrical Goods. The values of electrical appliances and fittings imported into Australia in the year 1917-18 were as follows:—

United Kingdom	£62,424
United States	104,268
Japan	46,288

The progress made by Japan will be noted, but the goods supplied have not been generally satisfactory.

In regard to electrical machinery there is little to be said until the effect of the reorganisation of the electrical industry in the United Kingdom makes itself felt. There is a prejudice in many quarters in Australia in favour of American electrical machinery which would indicate the desirability of some sort of organised British propaganda. Experiments have been made recently in Australia in constructing electric motors and generators, but the result can hardly be said to be satisfactory. The simpler forms of switchgear and apparatus can be quite well made locally. The demand for electrical machinery is likely to increase largely in the future.

As regards insulated wires and cables, the following table of imports from principal countries, is of interest as showing the remarkable increase of imports of this material from Japan.

Imports from	1913.	1916-17	1917-18
United Kingdom ...	£554,125	... £356,072	... £23,634
United States ...	20,485	... 19,103	... 31,994
Japan	—	... 7,421	... 123,776
Germany	56,450	... —	... —
Total imports	... £637,426	... £384,187	... £181,214

The Japanese cable has not been an unqualified success, and it remains to be seen what effect age will have upon it. Reference must again be made to various attempts to imitate the C.M.A. label by makers not members of the Cable Makers' Association, also to attempts to put wire and cables on the market, not in accordance with the specifications on the label attached to the goods. In some cases the fraudulent label has no doubt been attached after arrival in Australia. It is hoped that the label devised by the Cable Makers' Association will not be imitated, and will in conjunction with stringent Government regulations prevent the continuation of these fraudulent practices.

LEGAL.

KELLEY *v.* ELECTRICAL TRADES UNION.

In the King's Bench Division, before Mr. Justice A. T. Lawrence, this action, brought by E. H. Kelley, a member of the E.T.U., and foreman in the firm of Campbell & Isherwood, Ltd., electrical engineers, an establishment controlled under the Munitions Act, 1915. According to a report of the case published in the *Times* for October 17th, plaintiff alleged that he had been wrongfully expelled by resolution from the union, and he asked for a declaration that since April 20th, 1918, he had been a member of the union, and for an injunction restraining the union from acting on and enforcing the resolution. It was alleged by the union as the reason for the plaintiff's expulsion that he, as foreman of the firm, allowed a fitter named Grint, who was not a member of the union, to work on board H.M.S. *Melampus*. The plaintiff was not told under what rule he was expelled, but apparently it was under Rule 38 (*b*) for having disobeyed an order of the district committee. In 1915 a rule of the union was made that "no man be allowed to work aboard ship in the Port of London unless he has held a ticket for at least three months." The plaintiff employed the fitter to work in the *Melampus* although he did not hold such a ticket; and it was for the alleged breach of that rule that the plaintiff was expelled.

Our contemporary states that Mr. Justice Lawrence, in giving judgment for the plaintiff, said that the plaintiff was told by Grint that he was a trade unionist, but that he had not a provisional ticket, and the plaintiff believed that. Mr. Cox, the shop steward, who thought a ticket was not a provisional licence to work at that time, was not satisfied, and Grint was dismissed. Mr. Muir said that as officials they had to consider the men, and to work without friction they did not admit non-unionists. The plaintiff seemed to have acted on the same principle, and the evidence did not show that he disbelieved the statement of Grint at the time. The first point was whether the district committee had power to expel the plaintiff. It was clear that to do that was only within the power of the branch committee. He (his Lordship) could not accept Mr. Slesser's argument on that point. The district committee had no jurisdiction, and they acted against all justice in expelling the plaintiff when he believed the statement of Grint about being a unionist. Under Rule 41 there would have been jurisdiction, and the branch could have heard the complaint, but they did not. As to the hearing by the Executive Council, the plaintiff was not informed of it, and was not bound by it; he was not summoned. In fact, the executive did not look upon the hearing as an appeal to them, nor was it an original hearing. So there was no hearing at all by any tribunal which, under the rules, had power to expel the plaintiff. The plaintiff was therefore entitled to the declaration and injunction which he asked for, and there would be judgment accordingly for him.

EDWARDS *v.* HEWLETT.

In the City of London Court, on October 14th, before Judge Atherley-Jones, K.C., Mr. Ernest E. Edwards, trading as E. E. Edwards & Co., electrical and general engineers, 1, Cullum Street, claimed £39 14s. against Mr. Harry Hewlett, publican, of Stepney, for overhauling his electric light installation, and for other electrical and telephone work put in. Defendant had paid £5 15s. on account, and he had also paid £15 into Court in satisfaction of the claim with a denial of liability.—Mr. O'Malley, defendant's counsel, said there was a fixed contract made that the work would cost £10 to £15 at the most, and that it had been done so badly that another electrician had had to be called in.—Judge Atherley-Jones said that he would try the question of agreement, and the figures would go before the Registrar, where experts would attend to support their respective sides.—Mr. Ellis Hill, plaintiff's counsel, said that the defendant wanted certain electrical work done at his premises, and he employed the plaintiff to do it. No price was agreed, and plaintiff's prices were fair and reasonable. When the work was done three complaints were made. The first was that some of the electric lights which plaintiff supplied went out, and one of the holders went wrong. That was put right. It was also suggested that a switch had come off the wall, and that would have been put right but defendant's wife refused. There was no complaint of excessive price. Everyone knew that work and labour were very expensive nowadays.—Edwards, the plaintiff, said there was a great difficulty in getting labour in December last when the work was commenced. He denied that he agreed to do the work for £10 or £15. There was no estimate given of any kind or description. Defendant told him he was quite satisfied with the work.—Mrs. Hewlett, defendant's wife, said her husband was too ill to attend the Court. The electric light had been installed in her premises two or three years ago, and plaintiff suggested she should have some extra lights, and that some of the system should be overhauled. Plaintiff suggested that some telephones should be put in from one room to another. She asked the plaintiff what the work would cost, and he said £10 or £15. Plaintiff's man took weeks and weeks to do the work, and she "got fed up with him." When the bill came in she refused to pay it because it was excessive. She was quite sure that the plaintiff promised to send her a written estimate, but it never came. Plaintiff would be very well paid with £15. She did not know that £27 had been paid for materials. She had since paid £16 to have plaintiff's work done properly.—Charles Turner, who was plaintiff's assistant, but was not now working for him, said he had heard defendant's wife agree to £10 or £15. Plaintiff did not supply him with good materials. —Judge Atherley-Jones said that without casting any imputation on the defendant's wife, his view was that the agreement to do the work for £10 or £15 was not come to. He found accordingly, and directed the parties to go before an arbitrator to fix the amount of the items.

BUSINESS NOTES.

French Market for Electrical Goods.—Prior to the war a considerable amount of electrical goods was imported into France from Germany by French dealers in competition with other dealers handling French-made goods. The United States Trade Commissioner, who has been looking into this business, thinks that most of the recent inquiries in these lines have come from the former class of dealers who have lost their connections. He gives instances of points worth noting of French standards, *e.g.*, bayonet sockets instead of screw sockets, tumbler switches instead of snap switches, sheet-metal tube with crimped joint and lined with treated paper instead of heavy metal conduit. This light conduit employs sleeve unions instead of screwed joints. There have been inquiries regarding the conduit mentioned above, which is scarce in France at present. Other inquiries refer to: Multipolar snap switches, flush-type push-button switches, all fittings requiring hard rubber in their manufacture, high-candle-power, low-volt incandescent lamps for motion-picture machines. While there is a certain demand for the importation of electrical goods in France at present, and while it is undoubtedly worth while to solicit this business and to take orders, if possible, it is also well to bear in mind that there are French factories well equipped for making a full line of electrical goods, and that their production will be on the increase.

Commercial Training at Marconi's.—The problem of how a Londoner engaged in business can widen his educational attainments without undue strain has been solved by Marconi's Wireless Telegraph Co. on new lines. Commencing last week, the company has introduced as an optional item in the head office routine a series of classes in subjects likely to be of value in a business career. The office day closes at five, and at that hour all members of the staff wishing to attend the new classes are provided with light refreshments free of charge. The classes commence at 5.15, and last one hour, so that at 6.15, when the tube traffic has eased, the Marconi staff can travel home in comfort with one hour's useful study to their credit. The classes at present arranged for embrace elementary Spanish, elementary and advanced French, mathematics, bookkeeping and theory of commerce (elementary and intermediate). They have been arranged by the company's welfare superintendent, Mr. W. Randell, and are conducted by eight certified L.C.C. instructors. The entire expenses are borne by the Marconi Co., which has joined the Association for the Advancement of Education in Industry and Commerce, of which Lord Leverhulme is president.

New Belgian Company.—To further electric construction works in Belgium, the Société auxiliare de Constructions électriques de Belgique has been formed at Brussels. Among its founders are the Constructions électriques du Rhone (of Lyons) and the Société auxiliare des Tramways et Chemins de Fer (Brussels).

La Société Auxiliare de Constructions Electriques de Belgique is the name of a new company which has recently been formed in Brussels (23, Rue de la Regence), with a capital of £48,000, to carry on business as electrical engineers. The Société des Constructions Electriques du Rhone (procedes Dick-Kerr) is interested in the new undertaking.

Quite a number of the electrical undertakings in Belgium are just now increasing their capital. Thus, the Société d'Electricité de l'Est de la Belgique is advancing its capital by £80,000 to £200,000; the Société d'Electricité du Nord de las Belgique from £240,000 to £320,000; the Société Intercommunale Belge d'Electricité, of Brussels, from £80,000 to £160,000; and La Société d'Electricité du Borinage, of Paturages, from £140,000 to £280,000.

South African Demand for Miners' Lamps.—The United States Trade Commissioner at Johannesburg has been investigating the South African market for miners' lamps, for which there appears to be a keen demand. It is reported that one company is prepared to place orders for 15,000 of such lamps annually. The Trade Commissioner has forwarded two samples to his Government, and notes that in particular they must be of strong construction.

Swiss Electrical Industry.—The yearly report of the Swiss Association of Manufacturers of Electrotechnical Specialities gives some interesting particulars of the conditions of trade among the Swiss makers of accessory electrical appliances. For these firms the most urgent question is the supply of prime materials, such as electric steel, thin sheets, nickel, insulating material, electric porcelain, lamp globes, and sundry chemical products. Imports of these during the year were wholly insufficient, especially porcelain. In consequence, steps are being taken to start a factory for the last named, to meet a part at least of the home demand. The cost and difficulties of procuring imported goods had created a veritable crisis since the armistice. The general belief that prices would fall immediately as a consequence of the stoppage of the war had acted as a deterrent to the conclusion of business. Firms preferred to hold back and sought to sell off as much as possible of existing stocks, mostly manufactured at high cost. Exportation was likewise beset with considerable difficulty. Interdictions of importation and of transit by all the States surrounding Switzerland, led ultimately to the almost complete shutting up of the country's outlets. Severe strictures are passed on French restrictions, even Swiss goods sold at the Lyons Fair being undelivered. On the prospects of the future the report states: "Our industry will have to face two dangers; in the home market we have to fear being swamped by cheap German products; on the other hand, some foreign countries are about to forbid the importation of our products or saddle them with heavy duties, just short of total prohibition. We therefore demand that the Federal Council take such measures as are needful for our protection. Measures taken by the Association to ameliorate its evil conditions have been in the form of creating a public opinion in favour of home-made goods by the distribution of printed pamphlets to this end, and the institution of what is called a "Swiss week," during which sellers are pledged to sell only Swiss-made goods. Great success has attended these "weeks," and they have been held in each of the last three years. In a concluding paragraph the report summarises the policy of the Association as resistance to the flooding of Swiss markets with German products and a favouring of trade and exportation to entente countries, which, in the words of the report, "are destined to become our best customers and suppliers."—*L'Electricité*.

South African Electrical Market.—The South African *Mining and Engineering Journal* for September 27th reports: "It is said that several Japanese manufacturers have notified their agents here of big increases in electrical goods, especially in the form of wiring and cables, which are currently stated will amount to about 17 per cent. Another merchant said that he had been informed from Europe and from America that prices would certainly go higher, and he was of the opinion that this tendency of increasing prices would continue for some considerable time. Nor is it to be wondered at if, in view of the continued labour unrest in Great Britain and America, the tendency should be towards higher levels. As a matter of fact, seeing the unsettled state of affairs in the old world and the consequent increasing difficulties in obtaining raw materials, no improvement is looked for for some considerable time."

Society Plans All-Electrical Christmas.—The American Society for Electrical Development has announced a campaign to make this an All-Electrical Christmas. Representatives of the society have just completed a survey covering 16 States and the Province of Ontario, Canada, during which electrical conditions in every branch of the industry were studied at close range. In most cities the contractors, dealers, jobbers, and manufacturers reported the greatest demand in their experience. Manufacturers and distributors of electrical specialities particularly are far behind on orders, and dealers in these devices are finding a ready sale. As one retailer expressed it: "For the first time in the history of electrical appliance selling in this city people are coming into the store to buy large and expensive specialities, which heretofore we had to go out and sell with the hardest kind of selling." Based upon this information, the society has prepared complete and comprehensive sales and advertising material for holiday selling.

Private Companies: their Utility and the Exemptions they enjoy.—The modern business world has become so accustomed to the principle of trading with limited liability that one may be pardoned for forgetting that this principle was only established in 1855, and although there was a stage when a prejudice—not entirely unmerited—was felt against such companies, there is no doubt that the vast proportions of present-day industries, with their innumerable ramifications and complex relationships are to a large extent being developed through the facilities afforded by this mode of carrying on business. The association of persons for purposes of trading dates back, however, to remote times, being common in India, where a large part of Hindu law deals with the regulations of companies and guilds, whilst partnerships of merchants known as Gildæ Mercatores were in vogue in the ancient Roman Empire. In England the grant of charters to the Bank of England, the East India Company, the Hudson Bay Company, and similar enterprises, was followed in the eighteenth century by incorporation by Act of Parliament, a method adopted for the formation of canal, railway, water, and gas companies. In 1900 and subsequent years this method has been used for the incorporation of electric power companies, as affording better facilities for the acquirement of rights of a semi-public nature, such as the acquisition of land, the breaking up of roads, &c. The obtaining of a charter or the promotion of a Bill in Parliament is, however, unsuited to cases where such rights are unnecessary, and once the fundamental principle of registration with limited liability was established the advantages were so widely recognised that enactments applying it have now been placed upon the Statute Books of almost every civilised country. In the British Isles this possibility gradually led to the registration of private businesses with limited liability, and in 1907 the Legislature accorded full recognition to the "private company," thus giving the advantages of partnership without incurring its attendant serious disadvantages. The growth of private limited companies is proceeding apace, as the recent publishing of the ninth edtion of "Private Companies; their utility and the exemptions they enjoy," sufficiently testifies. This book of 71 pages (1s. 4d., post free) by Mr. Herbert W. Jordan, of the well-known firm of Jordan and Sons, Ltd., will be found of great benefit to those who are interested in this branch of company legislation, and will enable them to ascertain the method and advantages of conversion, with the exemptions and restrictions applicable to such companies.

We have it on good authority that the law is a "hass," but *ignorantia lex non excusat*, and the office of director or secretary of a company, either public or private, is one that should not lightly be undertaken. Such offices have serious responsibilities, and the Companies Acts, 1908 to 1917, contain many pains and penalties which the Courts may and do inflict for default, as may be seen from the not infrequent accounts of prosecutions for dereliction of duty. Should the well-meaning official be, however, too fully engaged in the details of business to read through a number of Acts, and yet be desirous of acquiring such knowledge, he may readily do so from the fourth edition of "Reminders for Company Secretaries" (32 pp., 11d., post free), written and published by the same author and publishers at 116 and 117, Chancery Lane, W.C. 2, the publishers making a speciality of filing such documents as must be sent to the Registrar of Joint Stock Companies.

Both books are carefully and clearly printed in large type, and should prove useful to those whose duty it is to see that the provisions of the Companies Acts are observed, the contents being carefully condensed to give the maximum of necessary information. J. J. H. S.

Bravo Dunedin!—We are indebted to a New Zealand correspondent for a copy of a local newspaper dated July 30th, reporting the proceedings at the Dunedin City Council when it was resolved to give preference to a British tender for electrical plant over an American tender which was £800 less. The Council, says the report, decided to accept the tender of the British Westinghouse Co. for a synchronous motor for Half-Way Bush, although the American General Electric Co.'s tender was £3,258, as against the British firm's £4,070, and the latter required a longer term for delivery.

Councillor Shacklock, in introducing the matter, said that at the last meeting of the council the matter of accepting a tender for the motor had been held over for further information by cablegram. This had been received, and the engineer recommended that the tender of the British Westinghouse Co. be accepted. The purpose of recommending this tender was to obtain a motor of English manufacture. An American machine could be obtained for £800 less, and delivery got in five months, whereas the British machine could not be delivered for nine months. The delay might involve some restriction on the users of electric power. He would move that the tender of the British Westinghouse Co. be accepted, provided delivery be given in nine months.

Councillor Sincock asked would the Westinghouse machine be a more durable machine, and what loss was involved to the small users (at present restricted) in the fact that the machine would not get here for nine months. Unless there was some defect in the American machine he felt inclined to adhere to their original idea of getting the American machine, which could be secured quicker.

Councillor Clark said he was surprised to hear Councillor Sincock. He hoped the Council would not go beyond the Empire because a little inconvenience or money was involved.

Councillor Shacklock, in reply, said the British Westinghouse machine was quite satisfactory. The department would do its best to meet the demands of the consumers without restrictions, and if such were necessary it would be only in the depth of winter.

The tender was accepted.

Service Notes.—Application for the free discharge of electrical fitters from the Royal Navy cannot be entertained, it is officially notified. Exceptional cases, however, may be considered. An Admiralty Committee is to meet and inquire into the conditions of service of the signal, telegraphist and detector branches. Every facility is to be given the committee, which will make a round of the chief naval home stations, taking evidence on the subject. The detector branch is a comparatively new one, and owes its origin to the late war. Its members are in charge of the most delicate electrical apparatus such as was used for the detecting of approaching submarines.

New Italian Electrical Companies.—The Società Generale Italiana di Transporti Autoelettrici has been formed at Milan with a capital of 2,000,000 lire, to further city transport with electric vehicles.

With a capital of 1,000,000 lire has been constituted at Venezia a company styled Veneta Impianti Materiali Electro Meccanici, for the manufacture of electric light and power material.

There has been formed at Rome, with a capital of 2,000,000 lire the Fabbrica Apparècchi Telefonici e Materiali Elettrici, whose speciality is the manufacture of telephonic and other electric apparatus.

At Verona a company has been formed with the title Antonelle e Orlando, for the manufacture of electric bread and pastry baking ovens and other electrical apparatus. Its capital is 50,000 lire.

The Società Anonima per Impianti Elettrici, with seat at Salcito (Campobasso), has been established for the production and distribution of electricity for public and private uses. Its capital is 130,000 lire.

A Società Radiotelegrafica Italiana is under formation, with a capital of 5,000,000 lire, for the foundation in Italy of a native industry in all electric departments, and particularly that of wireless, and thus render the country independent of outside assistance. The banking firm of Martini-Basagni, De Vecchi e Ca, of Milan, a newly-formed institution, is at the head of this scheme.

New French Electrical Companies.—The Compagnie Electrique de Franche-Comté (J. Bossert et Cie) is about to increase its capital by the issue of 6 per cent. bonds to the value of 400,000 francs.

The Société Electrométallurgique du Centre has been formed at Lyons, with a capital of 1,000,000 francs, to further the industry and trade in metallurgy and mechanics in general and in scientific apparatus and the manufacture and sale of 1/10 to 1 H.P. motors, &c.

With a capital of 500,000 francs has been established at Paris "Le Téléautomate": Société pour l'exploitation d'un nouveau systeme téléphonique, with a capital of 500,000 francs.

The Société d'Appareillage électrique et mécanique "Yole" is the style of a company started at Roubaix (Nord), with a capital of 50,000 fr.

For the planning and carrying out of public works connected with the generation and distribution of electricity, the Compagnie Industrielle de Travaux et d'Entreprises électriques has been constituted at Paris with a capital of 500,000 fr.

Under the style of Société "Intens," lumière, chateur et force, a company has been formed at Paris, with a capital of 60,000 francs, to carry out electric undertakings.

André Savary et Cie is the title of a company constituted at Paris for the manufacture of electrical machines. Its capital is 150,000 francs.

L'Electro-fourniture, with a capital of 10,000 francs, has been formed for the object indicated by its name.

Catalogues and Lists.—Messrs. Batteries, Ltd., Redditch.—Twenty-page pamphlet, excellently illustrated, describing the "NI-FE" accumulator (Jungner system—nickel—iron—alkaline), its constructional features and characteristics.

The Agricultural and General Engineers, Ltd., 50, Pall Mall, London, S.W. 1.—We were somewhat startled when we saw among our post the other day a pamphlet bearing the letters A.E. and G. upon its cover. Our normal composure returned, however, when inside we found the work to relate to the policy of the "A.G.E." the engineering trade amalgamation to which we referred in our last issue. A page is devoted to each of the firms included in the amalgamation, and the manufactures that they produce.

Automatic and Electric Furnaces, Ltd., 281-283, Gray's Inn Road, London, W.C. 1.—*Bulletin* No. 15, describing the magnetic sclerometer and its uses.

The Ilford Dry Battery Co., 83, Wool Exchange, Coleman Street, London, E.C. 2.—Priced leaflet relating to the Rève patent combined pocket battery and case.

British Insulated and Helsby Cables, Ltd., Helsby, near Warrington.—Illustrated pamphlet No. M 82 gives a description of the use of the Helsby condenser for lighting circuits, together with a simple diagram of connections. Pamphlet No. P 157 gives a description of the following: Yellow stoving varnish, yellow oil-resisting varnish, yellow air-drying varnish, black stoving varnish, quick-drying black varnish, anti-acid preservative varnish, together with directions for use and the results of pressure tests made with these varnishes. Illustrated pamphlet No. P 155, 12 pages, describes a new type of porcelain insulator for shipyard work, secondary insulation of pole lines, trolley-wire and H.T. overhead-line insulators, &c. Catalogue No. F 1, of 40 pages of well-illustrated matter, printed in the Swedish language, describes cables, insulating materials, insulators of all classes, fuse and distribution boxes, H.T. and L.T. junction boxes, switches and fuse carriers, rail bonding, trolley wires and insulators, energy meters, magnetos, primary cells, pinions, catenary suspenders, &c. Pamphlet No. P 152 gives particulars of "Prescot" paper pinions.

The Sun Electrical Co., Ltd., 118-120, Charing Cross Road, London, W.C. 2.—Pamphet No. 290, containing illustrations and descriptions of three new models of Sunlite lantern for half-watt lamps.

The Power Plant Co., Ltd., West Drayton, Middlesex.—Booklet (List No. 13) on mechanical power transmission dealing with gearing, gear shapers, thrust blocks, and flexible couplings, and giving some information about the firm and the specialities supplied by it.

Turner Bros.' Asbestos Co., Ltd., Rochdale.—Pamphlet on insulation of boilers and pipe-lines in connection with heat radiation and fuel economy.

The General Electric Co., Ltd., 67, Queen Victoria Street, London, E.C. 4.—Booklet (O.S. 2,198, August, 1919) dealing with Osram G.E.C. automobile type lamps, specially designed for automobile and aeronautical work.

Book Notices.—*Business Organisation and Management* is a new monthly mazagine (1s. 6d. net) published by Sir Isaac Pitman & Sons, Ltd.—It is a high-class production, containing a large volume of matter calculated to be of service to accountants, secretaries, managers and others engaged in commerce or industry. Among its many articles we observe contributions by Sir C. W. Macara on "Industry in Peace," "Motor Transport *v.* Rail Transport," by G. B. Lissenden; "Costing as a Sign-Post to Efficiency," by E. Miles Taylor; "An Industrial Magna Charter," by G. Mappin; "Machinery for Capitalisation of Reserves," by F. D. Head; "Systems of Office Lighting," by Leon Gaster; "Wages and Production," by P. D. Leake, &c.

We have received from the Eagle, Star and British Dominions Insurance Co., Ltd., another of its series of nicely-produced annual pocket volumes. It is a charming little book in which the baby has everything its own way, as, of course, it should do—for a time. Entitled "Baby—from Bud to Blossom," it tells in a most interesting way how the mother may bring the child through its early troubles until it reaches the age when, in the later educational years, it becomes a special financial burden to the parents. The latter then find the book closing quite unobtrusively with particulars of insurance plans for helping them smoothly through those perplexing times.

"Carry On," a publication of which only two numbers were printed, has been issued by the Underground to all members of the voluntary and loyal staff who rallied to the company's side during the recent strike. No. 2, the souvenir number, contains many illustrations, among which are the engine room at Lots Road and Wood Lane, the car works, the coal conveyor, and the boiler house, and several of groups of employés, meetings, and the accommodation.

"The Meaning of Mazda."—The B.T.H. Co., as an item in its new season's publicity campaign, has issued a most attractive painting book for children, describing in simple terms the mythological origin of the word "Mazda," which in ancient Persian means the "supreme light." A number of line drawings are employed to illustrate the progress and issue of the age-long combat between Mazda—the spirit of light—and the swart and malevolent Angro, who personifies the darkness which has been finally routed by the Mazda half-watt type lamp. These pictures afford an opportunity for the artist of tender years to exercise his embryo talent with crayon or brush. Limited quantities of this booklet (L 129) will be supplied, overprinted with contractors' names and addresses, on application to the British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C. 4.

"The Thermionic Valve and its Developments in Radiotelegraphy and Telephony." By Dr. J. A. Fleming, F.R.S. Pp. xv + 279; figs. 144. London: Wireless Press, Ltd. Price 15s.

"Mechanical Engineering" for 1920 (Foster's Pocket Reference Books). Manchester: Frank Foster, 98, College Road, Whalley Range. Price 2s. net (2s. 2d. post free).

Lead.—Messrs. G. Cawson & Co. report:—"The market generally closes at an irregular advance of 15s. to 25s. per ton. At the close October and November lead has been done at £28 17s. 6d.; December, £29; January, £29 to £29 5s.; and February, £29 7s. 6d. to £29 10s. . . . The outlook points to a continued firm market should speculators continue their operations; although, after the big advance, we think caution is necessary."

Messrs. James Forster & Co. report:—"The speculation in lead has again this week been rampant. . . . In the last two weeks prices have advanced nearly £3 per ton all round, and with such an enormous 'Bull' account open, the position can scarcely be called sound."

Dutch Wages Dispute.—The Netherlands General Metal Workers' Union has issued a notice intimating that negotiations have been proceeding since July with the electrical engineering firms regarding the introduction of the eight-hours' day and a new wages agreement based upon the existing collective agreement. As it has been impossible to reach an understanding on the basis of the Union's demands, the Netherlands Vereeniging van Electro-Technische Werkgevers (Employers' Association) is now threatened with the prospect of a strike.

Stolen Cable.—At Preston Sessions, on October 16th, on a charge of stealing 6 cwts. of copper cable and 18 cwts. of scrap lead, the property of the Blackpool Electricity Committee, Thomas Allan Smith (29) was sent to hard labour for three months; Jos. Regan (35), an army pensioner, was sentenced to four months in the second division; and Richard Smith (21) was found not guilty and discharged.

Auction Sales.—Messrs. Leopold Farmer & Sons will sell by auction at 2, Martin Street, Broadway, Stratford, on November 11th, the galvanising and nickel plant and tools of Electric Galvanisers, Ltd. The Assets Auctions Co., Ltd., will sell by auction on October 29th, at 119-121, Newington Causeway, S.E., a quantity of electrical fittings, &c. See our advertisement pages to-day.

The Rumanian Elektrica. — The Elektrica Co., of Bucharest, which was formerly the Rumanian branch of the German Lahmeyer Co., of Frankfort, and was placed under sequestration during the war, reports net profits of £19,000 for 1918 on a paid-up capital of £320,000. The Lahmeyer Co. retained a large shareholding on the transformation of the branch into a Rumanian company, but the Germans now claim, as usual, that these shares were transferred to Swiss ownership "a long time ago."

A Dutch Wire Lamp Issue.—Applications for subscriptions to 500 6 per cent. cumulative preference shares of 1,000 fl. in the N.V. Metaaldraad Lampenfabriek Volt, of Tilburg, have just been made in Holland. It is stated that the additional capital is required partly to cope with the constantly increasing business and partly to enable the company to participate in a similar undertaking.

The French in Alsace-Lorraine.—The formation has just taken place at Nancy of the Société Alsacienne et Lorraine d'Electricité for the purpose of studying and distributing energy, principally in Alsace-Lorraine. The promoters are the Compagnie Thomson-Houston, the Millery central station, the Société Alsacienne de Constructions Mecaniques, the Société des Forces Motrices du Haut-Rhin, the Ronchamp Colliery, and the banks in the redeemed provinces. The share capital is £40,000, although intended to be increased to £1,000,000.

The English Electric and Siemens's.—It is reported that arrangements are far advanced for the purchase of the business of Messrs. Siemens Bros. Dynamo Works, Ltd., by the English Electric Co., Ltd.

Bankruptcy Proceedings. — E. Cloney, tramways divisional superintendent, 5, Albans Road, Parliament Hill Fields, N.W. 5. First dividend 5s. in the £, payable at Carey Street, W.C.

Patent Restoration.—An order has been made restoring the following patent :—

No. 28,953 of 1912. Pascal Marino, "Salicylate electrolytes for use in the electrolytic deposition of metals or metallic alloys."

Non-Ferrous Mining.—At its meeting on October 13th, the Board of Trade Committee appointed to consider and report upon non-ferrous mining in the United Kingdom, decided to deal, in the first instance, with tin-mining, and will proceed forthwith to take evidence. Subsequently it will take up the question of zinc and lead-mining.

An E.D.A. Leaflet. — The Electrical Development Association has issued a leaflet (E.D.A. 24) on "The Minimum Charge," for the use of supply engineers. In simple language it explains the necessity and the justice of the charge, a payment for "readiness to serve" when no energy is actually consumed, which disappears, if as little as two or three units a week is consumed. Copies can be supplied from stock.

Government Sales.—In No. 10 of "Surplus," the publication of the Disposal Board, Ministry of Munitions, which is on sale, the Electrical Stores Section has been merged in the Plant and Machinery Section.

Liquidations. — Harry W. Cox & Co., Ltd. — On September 27th, at 84, Acton Lane, N.W. 10, it was resolved to wind up voluntarily, with Mr. B. H. Morphy as liquidator

Bachelet French Syndicate, Ltd.—Meeting, November 24th, at 3, St. James's Street, London, S.W., to hear an account of the winding up from the liquidator, Mr. J. S. Murray.

Another Amalgamation. — It is announced that Messrs. Stothert & Pitt, Ltd., of Bath, and Messrs. Torrence & Sons, Ltd., of Bristol, are to amalgamate.

Trade Announcements.—Mr. W. A. Hole, electrical engineer and contractor, has moved from 115, Cannon Street, E.C. 4, to 19, Southampton Buildings, Chancery Lane, W.C. 2, to which address all correspondence should be directed.

The Enterprise Manufacturing Co., Ltd., Gun Street Electrical Works, Bishopsgate, London, E. 1, have been appointed sole London agents for the Ironclad Switchgear Manufacturing Co., of Balsall Heath, Birmingham. They send a priced circular showing the first of a series of Ironclad switch and fuse gear, of which they carry stocks in London.

Messrs. Drake & Gorham Wholesale, Ltd., have removed their Liverpool branch to 61A, Bold Street, Liverpool.

Mr. W. J. Cannon, late of the Thanet Electric Co., has commenced business as an electrical engineer and contractor at 38, Gordon Road, Margate.

Mr. C. H. Scott, late R.E., has commenced business as an electrician at 50, Nelson Street, Bridlington.

Messrs. Welco Patents have appointed Mr. W. T. Rawcliffe, late of the General Electric Co., Ltd., Manchester, as their sales representative for Welco electric fire stoves, fixing frames, &c. His address is 3, Greengate, Victoria Bridge, Salford, Manchester.

Mr. H. Smith has removed to larger premises at 12, Longside Lane, Bradford.

Metal Quotations in Germany.—The Metal Exchange Department of the Berlin Stock Exchange, in the absence of a definite price basis for metals, has decided to publish twice weekly prices of metals according to contracts entered into on the exchange, and in the open market in Berlin. The quotations will concern electrolytic copper, refined copper, tin, spelter, lead, aluminium, nickel, &c. Among the names of the Committee who are to fix prices are to be found those of Beer, Sondheimer & Co., Aron Hirsch & Sons, the Berlin-Hagen Accumulator Co., the A.E.G., Hirsch Copper and Brass Co., and Siemens-Schuckert.

A Removal to Holland.—It is reported from Halle on the Saar that the firm of Th. Müller, of Zerbst, makers of dynamos and motors, have disposed of their manufacturing rights to Holland, and have sold their site to the Franz Braun Machine Tool Co., Zerbst.

American Export Plans.—According to the *Financier* the United States Steel Products Co., which is the export organisation of the United States Steel Corporation, is opening a branch office at Rotterdam.

Tough Rubber-Covered Cable.—Now that the demands of the Government have slackened, the Pirelli-General cable works (Southampton) for the production of tough rubber-covered cable is devoted to the production of this cable for private, as distinguished from Government, use. G.E.C. tough rubber-covered cable is made in all sizes, either single cored, twin, or three cored, and is specially suitable for use where a flexible cable, likely to be subjected to rough usage is required. In all cases, each core, which is of the best H.C. tinned copper wire, is insulated with pure and vulcanised india-rubber, in accordance with C.M.A. standards, and the whole then sheathed with tough rubber, this being water, oil, alkali, and acid proof, and will stand up to the roughest use to be met with in industrial work. For house wiring it possesses the valuable feature that it can be put directly into new plaster. On account of its peculiar qualities, special provision is made in the wiring rules of the Institution of Electrical Engineers for the use of this cable.

LIGHTING AND POWER NOTES.

Accrington.—Price Increase.—The T.C. has decided to charge for lighting a flat rate of 7d. per unit, and for heating and domestic use, other than through a separate meter, of 2½d. per unit. A fixed charge of 15 per cent. per annum on the rateable value of the house occupied, plus a charge of 2d. per unit for all units consumed, is to be made. For power, 4d. per B.T.U. for the first 100 units consumed per quarter, and for all over 6,000, 1½d. will be charged.

Ballymote (Co. Sligo).—E.L. Scheme. — The electric lighting scheme is now far advanced, and it is hoped that the installation will be made before the end of the year. The work of preparing the power station is being entered upon this week, and the machinery is expected to arrive without delay.

Bradford.—Shortage of Supply.—Owing to lack of plant caused by the breakdown of the 5,000-kw. Westinghouse turbine at the Valley Road Works, the Corporation has linked up with the Yorkshire Electrical Power Co., and is thus obtaining a supply of 1,000 kw. If it is found impossible to cope with the load, it has been suggested that the employés in the textile trades should start and finish an hour earlier than at present, so that the traffic may be eased at the rush hours.

South Africa.—Cape Town.—At a special meeting of the T.C. held on September 16th last, it was decided to appoint Mr. Charles H. Merz, of the firm of Merz & McLellan, consulting engineer to the Council. Mr. Merz has undertaken to advise the Council generally in connection with the development of the Council's electric light installation for a fee of £600 per annum, plus certain charges for time spent by members of the staff of Merz & McLellan upon work referred to them, also plus travelling and other expenses. The present capacity of the Council's plant is 8,000 kw., but the power station, Mr. Merz reported, was capable of containing machinery to generate 20,000 kw.

Carmarthen.— Price Increase.— The B. of T. has authorised the E.S. Co. to increase the maximum charge from 7d. to 9d. per unit as from September 29th last.

Chesterfield.—Year's Working.—The annual accounts for the past year show a deficit of £1,272. The income from lighting was £5,502, compared with £7,918 in 1914. The total revenue for the year was £24,731, against £24,443 in the previous year. Number of units sold was 4¾ millions, of which 3¾ millions were used for power. Since 1914 there has been a capital expenditure of £34,000.

Continental. — Alsace Lorraine. — La Compagnie Thomson-Houston, of Paris, and the Société Alsacienne et Lorraine d'Electricité are interested in a scheme for the establishment of plant to utilise the water power of the river Rhine at various points for the generation of electrical energy.

France.—The Ministry for Industrial Reconstruction has published the details of the programme of reconstruction in the liberated regions, as follows :—(1) Starting in working of the central stations at Lille, Valenciennes, Jeumont, and continuance of that at Hierson, set up by the Germans, and now taken over by the State ; all these stations generate three-phase current at 50 cycles per second in groups of 5,000 kw. ; (2) construction and putting in a state of working of the junction lines at 45,000 volts between Lille, Valenciennes, Douai, Cambrai, Jeumont, and Hierson ; (3) construction of 45,000-volt junction lines between the stations at Nœux and Bully-Grenay in the Pas-de-Calais section, and those at Pont-à-Vendin, Lille and Douai ; (4) connection together of the stations in the Pas-de-Calais section ; (5) connection of the 45,000-volt Nord section network with that of the Paris region by means of a 90,000-volt line from Pont-à-Vendin and Douai, and

passing through Arras, Albert, Montdidier and Creil; (6) creating, or restoring by means of concessions, mains from the above stations or from the junction network. Lastly, the programme contemplates the utilisation of the hydraulic energy of the Rhone and the Rhine.

SPAIN.—Under a concession recently granted, plant is to be established to utilise the water power of the river Segura, near Ulla, in the generation of electrical energy.

BELGIUM.—Although the demand for electricity was never greater, the Société Electrique Anversoise, of Antwerp, is finding it very difficult to carry on. Thus while the output during the financial year 1918-19 amounted to no less than 5,849,894 KW.-hours, as against only 3,759,682 KW.-hours in 1917-18, the balance-sheet shows a loss of about £29,000, this being due to the greatly increased cost of necessary materials, coal, &c.

Burnley. — EXTENSIONS. — The Sub-Committee has decided to recommend the Council to proceed as quickly as possible with a proposal to install in the existing station a 3,000-KW. turbo-alternator, at an estimated cost of £62,000, and to obtain borrowing powers to cover the contemplated expenditure.

Dover.—PRICE INCREASE.—The T.C. has applied to the B. of T. for power to increase the charge for electricity for lighting to 9d. per unit, and to charge for the current quarter 8½d., with ½d. discount for prompt payment. On the maximum demand scale the charge is to be the full lighting rate for the first 4½ hours plus 4d.; for power, 4d.; and for heating and cooking, 2½d. When the yearly accounts of consumers do not reach the minimum charge of 11s. 8d. per quarter, that charge is to be enforced.

Dunblane.— E.L. SCHEME.—The T.C. has decided upon an electric lighting scheme for the town.

Dundee.—NEW SWITCHGEAR.—The E.C. has accepted a tender for the supply of E.H.T. switchgear at Carolina Park station, at a cost of £14,150.

Edinburgh.—YEAR'S WORKING.—The annual accounts for year ended May 15th, 1919, show a revenue of £186,465, and a total expenditure of £126,795; a gross profit of £59,670, which, with £3,659 transferred from reserve fund to meet these charges, was disposed of in the following manner:—£14,513 to interest on loans, &c.; £9,234 income-tax; and £39,582 to liquidation of debt; units generated were 25,599,789, against 26,203,766; total units sold were 20,565,249, compared with 20,945,404; during the previous year. Number of units expended in distribution and unaccounted for, 2,012,771.

STREET LIGHTING.—Electricity is superseding gas in the streets in the housing area at Gorgie.

Continental.—FRANCE.—Both the ports of Havre and of St. Nazaire are to improve their port equipments, the former having been authorised to spend 770,000 fr. on the purchase of eight 1,500-kg. electric cranes with rails and cables, and the latter to set up 17 capstans, two electric cranes, and six steam cranes.

Glaslyn.—NEW SCHEME.—The North Wales Power Traction Co. estimates the cost per mile of transmission line to supply Portmadoc, Criccieth, Pwllheli, and Nevin with electricity at £1,500 for a single circuit line, making a total of £60,000 for the whole scheme.

Godalming.—PRICE INCREASE.—The B. of T. has granted the Urban E.S. Co., Ltd., an order to increase the maximum charge for electricity to 9d. per unit.

Grays.—PRICES.—The U.D.C. has decided to abandon the decision to make a minimum charge for electricity of 6s. 6d. per quarter, as there is no provision in the prov. order for such a charge.

Horsham.—PRICE INCREASE.—The U.D.C. has increased the price of electricity from 7d. to 8d. per unit for lighting, and from 2½d. to 3d. for heating and power.

India.—SIMLA.—The M.C. is extending its installation by 500 KW. A contract has already been placed with Messrs. Siemens Bros. for the supply and laying of six miles of H.T. underground cable, and it is expected that orders will be definitely placed for the supply of additional running plant, switchgear, &c. Four new sub-stations will be erected, and a 500-KW. turbo-alternator is to be installed in the power station. It is also intended to replace one of the existing exciter sets by one of sufficient capacity to excite all the alternators in the station. There appears to be every prospect of another new scheme materialising in the near future.—*Indian Engineer.*

Kidderminster. — PROPOSED PRICE INCREASE. — The Corporation has refused the application of the Shropshire, Worcestershire, and Staffordshire E.P. Co. for permission to increase the lighting rate from 6d. to a flat rate of 8d. per unit.

Linthwaite. — STREET LIGHTING.— The Huddersfield E.C. has decided to carry out the lighting at £3 plus 10 per cent. per lamp.

Lismore.—NEW STATION.—The Ballyin Mills are shortly to be converted into a power station for public and private lighting purposes.

London. — BETHNAL GREEN.— In July, 1916, the the Council approved of a sale or return scheme submitted by the British Thomson-Houston Co., Ltd., for the supply of three-phase motors. For some considerable time past, on account of war conditions, this scheme has not been in operation to any material extent, and the company now intimates that the scheme must remain in suspense for the time being. The company is prepared, however, to accept an order for motors and invoice them two to three months after delivery. It is important that the Council should obtain a stock of motors at a very early date, and it is estimated that the cost of motors which should be ordered immediately will be £3,750. As a matter of emergency, the Committee has authorised Mr. Couzens to obtain a quotation from the British Thomson-Houston Co., Ltd.

FULHAM.—According to the daily Press, at the first meeting of the Profiteering Committee, held on Wednesday last week, among other complaints was one against the Borough Council for making an unreasonable profit on electricity.

ISLINGTON.—PRICE INCREASE.—The B.C. has increased its charges for the supply of electricity by 20 per cent.

SHEPNEY.—YEAR'S WORKING.—The annual accounts for the year ended March 31st, 1919, show a gross profit of £65,680, representing rather more than 9½ per cent. on the averaged total capital expenditure at the end of the year, and nearly 14 per cent. on the outstanding balance of the loan account. Against this amount the interest on loans, bank overdraft, repayment of loans, &c., has to be charged, and after adding certain small items of miscellaneous income, a net profit of £22,245 was realised. £21,111 was added to the reserve fund. The total number of connections at the end of the year in question was 1,090,312. Station capacity, 16,500 KW.; maximum demand, 9,720 KW., units generated, 28,811,770; units purchased in bulk, 2,087,262; total 30,899,032, an increase of 560,526 units; total units sold, 25,383,085, an increase of 502,368 units on the previous year; total cost in pence per unit sold, 1·437d.; income per unit sold, 1·647d.

Midgley (Yorkshire).—E.L. SCHEME.—The District Council has decided to ask on what terms Halifax Corporation will supply the area with electricity.

Birmingham.—NECHELLS STATION.—The concrete piling work on the site of the new station is nearly finished, and the superstructure is well in hand, and it is hoped that the plant may be introduced by April next, so that the station may be ready for the winter load in 1920. Contracts to the value of £120,000 have already been placed for wooden cooling towers by Davenport Engineering Co., for telpher coal-handling plant by Mitchell Conveyor Co., and for transformers by Ferranti, Ltd.

Nelson.—NEW SCHEME.—The T.C. has reported that an agreement has been arrived at with the Colne Council for the supply of electricity in bulk by Nelson, so that energy for both towns would be produced by Nelson. According to expert advice, the two towns combined could produce electrical energy as cheaply as it could be produced anywhere else.

Nottingham.—PRICE INCREASE.—It has been decided to charge a flat rate of 6½d. per B.T.U., or at the rate of 8d. per unit up to an amount equivalent to 200 hours' consumption per half year, and 3d. per unit for all beyond that amount; 2½d. per unit is to be charged for power.

Peterborough.—YEAR'S WORKING.—It is reported that the annual accounts for year ended March 31st, 1919, show a deficit of £1,214, which is due to increase in costs, which had not been met by an adequate charge for energy. The units generated amounted to 1,293,403 units, the greatest output yet recorded.

Royston.— E.L. SCHEME.—The Yorkshire E.P. Co. cannot proceed with the new scheme for supplying Royston until the Electricity (Supply) Bill has been disposed of by the Government.

Stoke Poges.—MAINS EXTENSION.—The Slough and Datchet E.S. Co., Ltd., is proceeding at once to extend its mains to Stoke, Stoke Poges, Farnham Royal, and Farnham Common.

Swindon.—PRICE INCREASE.—The T.C. has increased the charge for electricity for lighting and power by a further 25 per cent., as from October 1st, and for energy for the tramways by 10 per cent.

Thirsk.—TOWN LIGHTING.—The P.C. has accepted the estimate of the Northern Countries Electricity Supply Co. for the lighting of the town.

Tilbury. — E.L. SCHEME. — The Port of London Authority has informed the U.D.C. that it cannot supply electricity to the district for lighting purposes, as it has no energy to spare.

Torquay.—PRICE INCREASE.—The T.C. has applied to the B. of T. for power to increase the maximum charge for electricity from 8d. to 1s. per unit. With regard to the supply to the Tramway Co., the Council has decided that unless the company is willing to agree to a fair price, it will apply, under the Courts (Emergency Powers) Act, for the suspension of the contract entered into with the company into 1912.

Tullow (Leitrim).—E.L. SCHEME.—An expert is to advise on the cheapest and best method of lighting the town by electricity.

Tunbridge Wells.—LOAN.—The Corporation is borrowing £30,000 for the extension of the electricity undertaking.

TRAMWAY AND RAILWAY NOTES.

Aberdeen.—Accident.—As a Corporation tramway-car was going along Gordon Street, on the 17th inst., the driver fainted and fell off the car into the street. The woman conductor was unable to reach the driver's platform owing to the crowd inside the car. After going about 100 yards the car ran into a van containing a number of children. Luckily, none of the occupants of the van was seriously injured. A young man on the top deck came down the front stairs, applied the brakes, and managed to stop the car as it was about to collide with a car in front.

Ashton-under-Lyne.—Proposed Purchase.—Arbitration proceedings are shortly to be commenced in London for the purchase by the Ashton-under-Lyne Corporation and neighbouring authorities of the Oldham, Ashton, Hyde and Denton electric tramways, owned by the British Electric Traction Co.

Birmingham.—The Ministry of Transport has extended until September 6th, 1920, the Corporation Light Railways Orders, 1912, and (Quinton), 1913, for the completion of certain works.

Bradford.—New Cars.—Owing to increase in traffic, and in spite of the number of new cars on order, the Tramways Committee is prepared to buy good cars.

Brazil.—Railway Electrification.—The Government has submitted a Bill to Congress for the electrification of the Central Railway from Rio de Janeiro to Barro do Pirahy, and also of the suburban lines in the Rio district. The preliminary surveys already authorised have now been completed, and the cost of electrifying the different lines scheduled is estimated at £340,000, while the cost of power stations, new rolling stock, &c., is estimated at a further £1,050,000. When the Bill receives the sanction of Congress, tenders are to be invited for the carrying out of the work, ample liberty being allowed for the proposal of any system of electrification as well as suitable bases for payments as credits are voted for the work.

Burnley.—Wages Increase.—The award to tramway and omnibus workers for increased wages will result in an additional charge on Burnley Corporation tramway department of approximately £4,000.

Continental.—Belgium.—The employés of the Liége tramways called a strike on Thursday morning last week.

All the Brussels tramway services were also suspended last week. The strikers are demanding the incorporation of their bonus in their regular wages. The Minister of Public Works declares that negotiations cannot be undertaken before the resumption of work.

France. — The construction of an electric railway between Grenoble and Nice having been deemed desirable, it has been decided to invite the submission of competitive plans for the scheme, for which a prize or prizes, amounting to 50,000 fr., will be given. The Chamber of Commerce of Grenoble has taken the lead in the matter, as representative of six other Chambers. The track proposed may take account of such sections of lines as exist, or be an entirely distinct track. The line is to have two sets of metals, and be of normal gauge, exhaustive details to be given, with inclusive cost; the system of electric traction proposed is to be the subject of special consideration. August 20th, 1920, is the date fixed for sending in the schemes, addressed to the Chamber of Commerce of Nice.

The immediate disbursement of 700,000,000 fr. has been decided upon by the French State Railways Administration for the purchase of 730 locomotives, 1,450 coaches, and 10,000 wagons. Private French companies have likewise issued orders for 120 locomotives and 1,509 coaches. These simultaneous orders are induced by the conviction that existing rolling stocks are inadequate to deal with the present traffic.

According to the *Morning Post* an electric train ran through the streets of Paris on Wednesday, last week, following the outer boulevards. It was composed of a front 80-h.p. motor-car and five trailer cars, each with a motor. Accumulators were attached to each of the trailers to enable them to be run independently if required.

Owing to the shortage of coal the public has been warned that the Underground electric trains may have to travel at a lower speed.

Germany. — A municipal strike commenced, last week, at Berlin, and all the tramways stopped running on the Tuesday night.

Italy.—The *Financier* states that several conferences took place recently between the representatives of the Italian electrical industry and those of an American financial group, headed by the National City Bank, to deal with the financial and industrial questions connected with the proposed electrification of the Italian railways. According to a Naples contemporary, it has been decided to form a company, with a capital of 300 million lire, of which half is to be subscribed by the American participants, and which is to take up the transformation of the traction system. Interested in this concern are further electrical enterprises and leading steel and engineering companies, which are to supply the power stations and the constructional works, as well as the railway material. The four leading banks, the Banca Commerciale, Banca di Sconto, Banco di Rome, and the Credito Italiano, are also participating.

Spain.—The first completed section of the Madrid underground railway was officially opened to the public by King Alfonso on the 17th inst. This section of the Madrid tube railway, the first of its kind in Spain, covers a distance of 4 km. (2½ miles), running north to south from Cuatro Caminos to the Puerta del Sol, the central part of the metropolis. The first track has taken 2½ years to construct, and the opening took place on the exact day forecasted by the engineers at the time the concession was granted by the Government. The material and rolling stock are of up-to-date manufacture, and, with the exception of a few small items, everything used in the work of construction was produced in Spain. The enterprise is financed by purely Spanish capital. The directors and engineers are Spanish, while the first name on the list of shareholders is that of King Alfonso, after whom the concern is called, "The Metropolitan Co. Alfonso XIII." The cost of the first section has been about 8,000,000 pesetas (about £320,000). There is a double electric track, capable of running a three-minute service both ways, each train conveying up to 500 persons, if necessary. The official run gave complete satisfaction, and work on the second section will be commenced immediately.

Sweden.—The State Railway Administration of Sweden, in the course of a report respecting new works to be carried out in 1920, asks for an allocation of 16,700,000 kronen (£917,000) for the conversion to electric traction of the line from Kiruna to Svarton. During the past three years the Riksdag has apportioned a total of 5,500,000 kronen for this purpose, and only preparatory works have, so far, been carried out, so as to keep the expenditure as low as possible. Owing, however, to the great difficulties experienced in the coal market, the Administration now considers it desirable to endeavour to proceed with the conversion of the whole of the railway as soon as possible, and to complete it by the end of 1921, with the exception of certain sidings. It is calculated that on electrification an annual fuel economy of 42,000 tons of coal will be obtained on the transport of 2,000,000 tons of ore from Kiruna to Svarton, or of 58,000 tons of coal if 3,000,000 tons are conveyed, and an economy of 74,000 tons of coal if 4,000,000 tons of ore are transported by the railway.

South Africa.—Durban.—After one day's strike the tramway dispute was settled late at night on the 13th, the Town Council conceding a number of the men's demands.—*The Times.*

Dundee.—Dundee, Broughty-Ferry and District Tramways Co. is terminating its arrangement with the Corporation Electricity Department, the proposed rate for energy being prohibitive, viz., 1·75d. plus 10 per cent.

Edinburgh.—The cost of the new buildings at Shrubhill depôt of the Corporation tramways is £12,000; and other improvements, £3,500.

For the electrification of the Pilrig and Liberton section of the tramways, the proposed car sheds, stores, &c., represents an outlay of £35,000.

Egypt.—Strike.—The strike at Alexandria has been settled, the men having been granted a 40 per cent. increase in wages, an eight-hours' day, and a fortnightly holiday. The fares have been increased to counterbalance the increased expenses.

Halifax.—New Schemes.—The Tramways Committee, last week, considered the promotion of a Bill in Parliament to obtain powers for tramway extensions from Hebden Bridge to the district boundary at Whiteley Arches, which would shorten the break in continuity of tramway service between the centres of Yorkshire and Lancashire. Another matter which might be included in the Bill would be a new line to Elland *via* Elland Wood Bottom.

Lancaster.—Dispute.—The Corporation has declined to agree to a proposal that it and the Morecambe Corporation should pay the Lancaster and District Tramways Co. £8,000 for the right to take up the tramlines on the Lancaster-Morecambe road so as to improve the thoroughfare.

Liverpool.—Wages.—The effect of increased wages and general working expenses upon the Corporation tramways were explained by the chairman at the meeting of the Tramways Committee on the 15th inst. As the result, he said, of carrying out the agreement of March, the wages bill had increased by £92,000, and a further £30,000 would be added to the annual wages bill by the recent arbitration award. In the last five years expenditure had increased by 114 per cent., of which labour was receiving 81 per cent. Despite the carrying of 10,000,000 passengers more than last year, and the takings being £120,000 more, the surplus had decreased by £60,000.

London.—Willesden.—Having delayed a tramcar by refusing to pull his cart off the track, a man was fined £2, with £2 2s. costs.

Season-Ticket Strike Allowances.—The Railway Executive Committee announced last week that the railway companies have been authorised to make an allowance on residential season tickets to cover the period of non-use during the strike.

To afford relief to the underground railways at rush periods, certain omnibus services have been strengthened between points served by the District, Hampstead, and Piccadilly lines.

Accidents.—An L.T.U. car failed to take the points at Kew Bridge on Friday morning, last week; jacks had to be used, and the service was disorganised for some time.

Some delay was caused on the District Railway, last week, by the breakdown of a train between Sudbury and Ealing Common.

An omnibus and a tramway-car collided in the fog in Lea Bridge Road, Leyton, on Sunday afternoon.

In some districts the District Railway tramway services were delayed by fog during the week.

L.C.C.—The Stepney Metropolitan B.C. still objects to the electrification of tramways in Burdett Road, Grove Road, &c., by means of overhead conductors.

The car shortage on time-table requirements was further reduced from 36 cars on 26th June, 1919, to six cars on 1st October, 1919.

Oldham.—Holiday Service.—The Tramways Committee has decided to suspend the service on Christmas Day, and to make a grant of £75 towards the expenses of a "welcome home" to ex-service men in the department, to be held on that day. Out of the department, 370 men enlisted, and of these 191 have returned, in addition to which 100 other ex-soldiers have been taken on.

Rhondda.—Threatened Strike.—The employés of the Rhondda Tramways Co. have tendered seven days' notice on account of the dismissal of a driver who, it is stated, ran his car to a certain station 13 minutes before the schedule time.

Rochdale.—New Cars.—It is proposed that 10 new cars should be bought.

Wolverhampton.—Increased Fares.—The T.C. has raised all fares by ½d. The minimum ordinary fare is now 1½d.

York.—Electric Omnibuses.—A protest has been lodged with the City Council by the ratepayers in the Burton Stone Lane district against the electric 'bus service. An alternative suggestion is for the extension of the tramway system, or the providing of railless traction.

TELEGRAPH AND TELEPHONE NOTES.

France.—The Paris public telephone booths are to be closed on Sundays.

Italy.—The Italian Government, according to a cable received from H.M. Commercial Counsellor, Rome, has decided that from October 13th land cables and wireless between Great Britain and Italy are accepted in any of the following codes:—A.B.C., fifth edition; Western Union, Lieber's, Bentley's Complete Phrase (exclusive of separate supplement for mining and oil trades). Bromhall's Imperial Combination (excluding rubber appendix); Meyers' Atlantic Cotton, thirty-ninth edition; Scott's, tenth edition; Pasi and Lugagne. Name of code used must be prefixed to message.

Underground Cables.—The Epsom R.D.C. has refused permission to the Government to open the roads for the purpose of substituting underground cables for overhead telephone wires, on the ground that it is "unnecessary and extravagant expense."

West Indian Cables.—In an article in the West India Committee's Circular of the 16th inst., attention is drawn to the unsatisfactory state of telegraphic communication to and from the West Indies and British Guiana, and an "all-British" system is advocated. The Committee favours the laying of a cable from Jamaica to St. Lucia, or from Bermuda to Barbados or St. Kitts, to free the islands from foreign control and ruinous charges. The Inter-Departmental Committee has the scheme under consideration, and in reply to a letter from Lord Milner, the West India Committee emphasises previous suggestions made by it as to new cables and the further development of inter-Colonial wireless communication.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia. — Sydney.—December 19th. Metropolitan Board of Water Supply & Sewerage. Centrifugal pumps, electric motors, &c., for the low-level pumping station, Marrickville. Offices of the Board, 341, Pitt Street, Sydney.*

January 19th, 1920. Sub-station equipment (except power transformers). Contract No. 558.*

Melbourne. — P.M.G.'s Department. January 20th, 1920. Automatic telephone switchboard at Collingwood. Schedule 1,583. (September 19th.)

December 3rd. Victorian Railways. Portable electric welding set and accessories. Secretary for Railways, Spencer Street, Melbourne.*

Belgium.—November 3rd. The present concession expiring in May of next year, the municipal authorities of Ninove are inviting tenders for the concession for the supply of electrical energy for lighting and power purposes in the town. The conditions may be obtained on application to the Secretariat, Hotel de Ville, Ninove, Belgium.

December 19th. The Permanent Deputation of Limburg. For the concession for the distribution of electrical energy for lighting and power purposes in Limburg. The specifications and plans may be consulted up to December 1st at the offices of Prof. Gillon, 99, Rue des Flamands, Louvain.

Bolton.—November 11th. Electricity Committee. One 8,000-kw. turbo-alternator, with condensing plant, four water-tube boilers. (October 17th).

Coventry.—October 28th. B. of G. E.L. installation, London Road Institution. Mr. T. F. Tickner, Architect, 14, Little Park Street.

Egypt. — Alexandria. — November 15th. Egyptian Postal Administration. General stores for 12 months, including several electrical items.*

Leeds.—November 13th. City Council. Single-phase, 2,000 and 6,600 volts, and Scott-connected transformers, 14,000 k.v.a. capacity; also transformers required during a period of two years. (See this issue.)

London.—Hampstead.—November 3rd. B.C. Tenders from November 20th, 1919, to March 31st, 1920, for oils for the electricity station, and removal of ashes, clinker and boiler refuse. (See this issue.)

Manchester.—October 31st. Waterworks Committee. One set of electrically-driven, high-pressure, centrifugal pumps. Secretary, Waterworks Offices, Town Hall.

November 11th. Tramways Committee. Special track work. Mr. J. M. McElroy, General Manager.

Rhondda.—November 5th. U.D.C. Electricity Department. Two sets of sub-station switchgear. (October 17th).

Southampton.—October 29th. B. of G. Electric motor and wiring (bakery). Mr. A. J. Walden, Clerk.

Spain.—January 2nd. The Spanish Ministry of Public Works in Madrid. For the concession for an electric railway between Madrid and the Port of Valencia.

Tunbridge Wells.—Electricity Department. One 750 to 1,000-kw. turbo-alternator, surface condenser and pumps, wet-air filters, piping, economiser, induced-draught fan and engine, and extensions to switchboard, &c. (See this issue.)

York.—October 27th. N.E. Railway. Six or 12 months' supply of telegraph apparatus, telegraph wire and line stores. (October 17th)

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence), London.

CLOSED.

London.—The L.C.C. has accepted the tender of Messrs. Dick, Kerr & Co., Ltd., amounting to £83,461, for the construction of authorised tramways from Lee Green to Eltham; also the tender of Messrs. W. Manders & Co., amounting to £42,528, for the construction of High Street, Wandsworth, and East Hill Tramways.

Shoreditch. — Electricity Committee. Distributing mains. Accepted:—

700 yd., 1 sq. in., single-core, paper-insulated, lead-covered cable, £748.—Union Cable Co.

1,550 yd., 1·13 sq. in., three-core, paper-insulated, double-armoured, E.H.T. cable, £1,728; and 1,550 yd., 7/20, six-core, pilot cable, £300 per mile.—Edison Swan Electric Co.

Service cable:—

880 yd., three-core, 7/16 cable, £203; 880 yd., three-core, 7/14 cable, £159.—Pirelli-General Cable Works, Ltd.

One 2,000-kw. feeder, cubicle and desk panel, for use on 6,600-v., A.C., three-phase, 50-period system, £977.—Metropolitan-Vickers Electrical Co., Ltd.

FORTHCOMING EVENTS.

Association of Mining Electrical Engineers.—October 24th and 25th. Annual general meeting. At Edinburgh.

London Branch.—October 29th. Ordinary general meeting.

Junior Institution of Engineers.—Friday, October 24th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette on "Fire Prevention and Protection in Factories and Workshops," by Capt. S. W. Thorpe, Chief Officer, Kodak Fire Brigade.

Friday, October 31st. At 39, Victoria Street, S.W. At 7.30 p.m. Social evening.

Institution of Mechanical Engineers. — Friday, October 24th. At the Institution of Civil Engineers, Gt. George Street. At 6 p.m. Presidential address, by Dr. E. Hopkinson, M.P.

Physical Society of London.—Friday, October 24th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Papers on "A Meter for Measuring the Rate of Flow of a Gas," by N. W. McLachlan, D.Sc., M.I.E.E.; "A Cheap Micro-balance," by J. H. Sharby, B.Sc.; and "The Resolution of a Curve into a Number of Exponential Components," by J. W. T. Walsh, M.A., M.Sc.

University of London.—Friday, October 24th. At University College, Gower Street, W.C. 1. At 5 p.m. Public lecture on "Recent Developments in Public and Private Lighting," by W. C. Clinton, B.Sc., M.I.E.E.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, October 24th. At Bolbec Hall, Newcastle-on-Tyne. Presidential address, by Mr. A. E. Doxford.

Birmingham and District Electric Club.—Saturday, October 25th. At the Grand Hotel. At 6.30 p.m. Ladies' night.

Manchester Association of Engineers.—Saturday, October 25th. Discussion on "Prices and Conditions for the Supply of Electric Power to Works," to be opened by Mr. J. Frith and Dr. Cramp.

Institution of P.O. Electrical Engineers (London Centre).—Monday, October 27th. At the Royal Society of Arts, John Street, Adelphi. At 5.30 p.m. Paper on "Aircraft Telephones."

Wireless Society of London.—Tuesday, October 28th. At the Institution of Civil Engineers, Gt. George Street, Westminster, S.W. At 6 p.m. General meeting and exhibition of apparatus.

Society of Technical Engineers (Birmingham Branch).—Friday, October 31st. At the Chamber of Commerce, New Street, Birmingham. At 7 p.m. Lecture on "The Problem of Transport," by Prof. F. W. Burstall, M.Sc., &c.

NOTES.

Electricity Supply Rifle League.—The following are the results of the matches to date in the above League :—

City of London, 556 (Harlow 99) *v.* Hackney, 470 (Rolfe 93); City of London, 562 (Smith 96) *v.* Shoreditch, 556 (Weekes 96); Shoreditch, 560 (Flavell 98) *v.* Hackney, 471 (Turner 94); Metropolitan, 575 (White 98) *v.* Shoreditch, 565 (Flavell 98); Metropolitan, 570 (Taylor 98) *v.* City of London, 559 (Harlow 99); Metropolitan, 578 (T. Jennings 98, T. Holder 98) *v.* Hackney, 547 (Hilling 95, Marriott 95).

The League table to date is as follows :—

Club.	Shot.	Won.	Lost.	For.	Against.	Points.
Metropolitan ...	3	3	0	1,723	1,671	6
City of London ...	3	2	1	1,677	1,596	4
Shoreditch	3	1	2	1,681	1,608	2
Hackney	3	0	3	1,488	1,694	0

Forthcoming Exhibitions.—The Military and Naval occupation of the Crystal Palace will come to an end on December 31st next, and arrangements now in progress will then be completed for an annual season lasting from May to October, when a War Exhibition arranged by the Imperial War Museum will be held. Before the season begins next year a British Industries Fair, organised by the Board of Trade, will be held at the Palace.

The twelfth "Foire de Paris" will take place in March, 1920, at Cours la Reine, the Esplanade des Invalides, and the Champs de Mars. There will be exhibits under the following headings :—Building, ceramics, lighting, electricity, heating apparatus, metallurgy, machinery, transport, &c.

The Roads and Transport Congress and Exhibition will be held at the Royal Agricultural Hall, London, from November 20th to 27th.

The Thirteenth International Motor Exhibition will be held at Olympia, London, W., from November 7th to 15th.

Proposed French Tax on Gas and Electricity.—During the past 10 years schemes have been prepared in France for the taxation of the consumption of gas and electricity, on every occasion when new sources of revenue have been suggested, but the Budget Commission has always rejected the proposals. This year, however, the Commission has agreed to the scheme, which, if sanctioned, will impose a tax of 10 per cent. on the sale price of gas and electricity for private lighting and heating purposes.

Embezzlement Charge.—At the Manchester City Police Court, on Saturday last, a charge of embezzlement was laid against John William Hewett, aged 45, a cashier in the employment of the Manchester tramway department. Prisoner was stated to have misappropriated the sum of £2,000 between June 24th and September 29th of this year. Mr. A. F. Pickford, who prosecuted, said the amount involved was considerably in excess of the sum mentioned in the warrant. He asked for a remand until Friday, October 24th, and this was granted.

Scientific Workers' Social.—The National Union of Scientific Workers (secretary, Mr. E. Sinkinson, 19, Tothill Street, S.W. 1), is holding a social evening at 52, St. Martin's Lane, W.C. 2, on Thursday, October 30th, at 7.30, to inaugurate a London Branch of the Union. The meeting will be open to all scientific workers.

Educational.—The War Office announces that the R.A.M.C. is to train men not over 21 years of age for special work, including X-ray and laboratory work. Accepted candidates will be required to serve for seven years with the Colours, and will receive the rates of pay laid down by the new warrant while qualifying. Men over 21, and not exceeding 35, who are already qualified in any of the classes, will be accepted for service, and should have good prospects of a career.

The Eastern Telegraph Co. is, we learn, about to open a new school of telegraphy in Fitzjohn's Avenue, Hampstead, N.W., of which Mr. J. H. Stephens has been appointed principal.

The London City Corporation has referred to a Committee a resolution that industrial technical education should be made a compulsory subject in all commercial training.

The Batti-Wallahs.—At the luncheon held on Monday at the Holborn Restaurant, at the close of the speeches "Uncle" Pooley was called upon to make a few remarks about coming events. He announced that there were to be five informal events during the season—the first on November 5th—and at least one smoking concert.

American Labour Disputes and the Electrical Press.—We have received from the *Electrical World*, New York, in place of the copy of that journal which should have arrived by the last mail, a type-printed page of news. The various industrial disputes that have taken place in the States lately reached the periodical Press, and prevented the appearance of over 200 papers. The page of news items concludes as follows :—"While it is appreciated that this very shallow summary of the news cannot take the place of a regular issue of the *Electrical World*, still we trust that it will help to keep readers posted on the high spots until such time as labour can adjust its internal organisation squabble and permit us to print again." We wish our contemporaries a speedy issue out of all their tribulations—indeed, we hear that the strike is now at an end. The missing number was, we believe, the first due for October.

British Oil.—Official estimates state that 8 million gallons of oil have steadily flowed at the Hardstoft Well, near Sheffield, since the stratum was first penetrated. The flow has now attained an average of over 2,000 gallons per 24 hours. Drilling has been suspended, but will be resumed at a later date.

Appointments Vacant.—Telegraph mechanicians (£285 + £120) for the Posts and Telegraph Department, Nigerian Government; assistant electrical engineer (85s.) for the Paisley Corporation electricity department; assistant instructor in electrical engineering (£175 + additional salary for evening work) for the Wimbledon Technical Institute; switchboard attendant for the Kendal electricity department; lecturers in mechanical and electrical engineering and mathematics (£350) for the Loughborough Technical College; switchboard attendant (£3 + 28s. 6d. + 12½ per cent.) for the Walthamstow U.D.C. electricity department; cable foreman for the Hackney Corporation electricity works; electric lighting foreman (£240 + 20 per cent. war bonus + a duty allowance of £30 from the fifth year of the appointment), for the Ceylon Government Railways; shift engineer (£293), for the Sunderland Corporation Electricity Department; E.H.T. plumber jointer, for the Swansea Borough Council Electricity Works; telegraph inspectors (£160 + £70), and electrical mechanicians (£200 + £65), for the Posts and Telegraph Department in German East Africa; lecturer and demonstrator in electrical engineering (£225 to £315), for the Regent Street Polytechnic. See our advertisement pages to-day.

Institution and Lecture Notes.—Wireless Society of London.—The next general meeting of the Society will take place at the Institution of Civil Engineers, Gt. George Street, Westminster, on Tuesday, October 28th, at 6 p.m., and it is hoped that all those available will be present; after five years of inactivity due to the war, the Society is again busy in the interests of experimenters and amateurs interested in wireless telegraphy, and this first general meeting will be an important one. We are told that there will be an exhibition of wireless apparatus from several different sources. Particulars of the Society can be obtained from the hon. secretary, Mr. Leslie McMichael, 30, West End Lane, West Hampstead.

Birmingham Metallurgical Society.—At a meeting of the Society, on the 16th inst., a paper was read by Mr. W. H. J. Vernon on the corrosion of metals. The author discussed the genesis of corrosion, together with the chief factors influencing its subsequent course. Particular stress was laid upon electrochemical action in the practical problems of corrosion, and an example was quoted of the fracture of a propeller-shaft brought about by this type of corrosion. The action of internal galvanic couples in effecting the corrosion of metals and alloys was demonstrated. It was pointed out, however, that while in the light of the electrolytic theory perfect homogeneity should ensure freedom from corrosion, non-homogeneity, still without defection from the theory, did not necessarily stand for corrodibility. The action of light was found to set up a curious type of electrochemical corrosion.

University of London, University College.—A public lecture, entitled "Recent Developments in Public and Private Lighting," will be delivered by Mr. W. C. Clinton, B.Sc., M.I.E.E., at University College, London, on Friday, October 24th, at 5 p.m. The lecturer will deal with the new sources of light that have become available within the last 10 years, and the increased efficiency and convenience due to their introduction. It is hoped to have on view some samples of modern lamps and accessories. Tickets of admission may be obtained by sending a stamped addressed envelope to the Publications Secretary, University College, London (Gower Street, W.C. 1).

Society of Technical Engineers (Birmingham Branch).—The first general meeting of the winter session, 1919-20, will be held on Friday, October 31st, at the Chamber of Commerce, New Street, Birmingham, at 7 p.m., when Prof. F. W. Burstall, M.Sc., M.A., &c., will lecture on "The Problem of Transport." All technical engineers are cordially invited.

The State and Electricity.—"We require electricity in this country more than any other power," said Mr. Edward Shortt, the Home Secretary, speaking on "State Electricity" at a meeting of the Eighty Club on the 15th inst. It was wanted in the development of agriculture, he continued, and in all the problems of industrial competition with other nations, as well as in those of transport and housing. The country must be made self-supporting, not by artificial means and State bounties, or by means of tariffs, but by making the system of agriculture more efficient and more complete. And that largely depended upon the cheap and organised production of electrical power. Complete and efficient transport could only be run by means of electricity, and the housing of working men in decent neighbourhoods was a question of transport. One of the great objects before the country was the generating of power for a smaller consumption of coal than at present. The water power of this country could be used to a much greater extent.

Electrically-Propelled Fishing Vessels.—The Norwegian fishing fleet includes no less than 10,000 motor-boats, and the lack of petrol led the Fishery Administration to consider the substitution of electricity. According to the *Revue Générale de l'Electricité*, the inquiry has, up to the present, shown that the accumulators obtainable commercially are too heavy and costly for the purpose, besides being too restricted in capacity to give the range of action required. The problem is, however, regarded as soluble, and the Cabinet is to demand from Parliament a credit of 20,000 crowns for the purpose of carrying out research work at the Trondhjen Technical School on electrical propulsion of fishing boats.

Australian and New Zealand Soldiers Training at the B.T.H. Works.—Shortly after the signing of the Armistice, the Australian Commonwealth, for the benefit of its soldiers who on account of lack of transport facilities would have to remain abroad some time, inaugurated an educational scheme to enable them to improve the opportunity while in Great Britain by employing their time profitably in obtaining training in various industries. In the accompanying illustration we are able to show a group of Australians training under the above-mentioned scheme, and a representative of New Zealand, taken at the works of the British Thomson-Houston Co., Ltd., at Rugby. The original number indicated by the B.T.H. Co. that it could accommodate under the above scheme was ten, but so great was the desire expressed to take the course that eventually room was found for accommodating 43. This included a number of New Zealanders (not covered by the Australian scheme), who were taking an intensive course on their own account. Every facility was placed at the disposal of the men by the B.T.H. Co. to give them just such training as each particularly desired, without any restriction, and that this was highly appreciated by them is indicated by their hearty thanks and regrets when their course was either curtailed or ended owing to transport being available. The course has greatly benefited those taking it, and the keen spirit shown in getting all the experience possible in the limited time was only exceeded by their regret that, owing

Australians Training at the B.T.H. Works, Rugby.

to transport difficulties now no longer existing, the course ends by October 31st. The names of the soldiers shown in the group are as follows:

Back row, reading from left to right.—G. B. Wilson, C. J. de la Cour, F. L. Page, E. J. Fowler, A. J. Dix, F. R. Umhauer, J. Currie, L. L. Burns, C. E. Braybon, C. E. R. Irwin.

Second row, reading from left to right.—C. B. Ransom, H. W. Perkins, R. Featherstone, A. J. Coker, F. B. Gentle, H. D. Hopkins, G. M. Halpin, C. J. Mundy, R. J. Smith, F. B. de Steiger, J. E. Peacock.

First row, reading from left to right.—L. J. Clifton, J. Moffat, R. W. Parsons, A. S. Cox, K. Willis, H. A. Dodd.

The Telephone Service.—Mr. Illingworth received a deputation from the National Union of Manufacturers on the 16th inst. Col. Sir Frederick Hall, D.S.O., M.P., in introducing it, said the Union represented £5,000 million, and it had received an enormous number of complaints about the telephone service. The P.M.G., in reply, said that when the Post Office took over the system they laid out £1,350,000 a year on it. During the war and up to March this year, owing to a shortage of labour and material, they had only expended £260,000 a year on its maintenance. Since the armistice they had drawn out a programme for this year in which they intended to lay out £3,000,000 on new exchanges, improving lines, putting on extra lines and switchboards, and generally getting the service back into a more satisfactory condition. In 1914 there were only 4 per cent. of the staff who had had less than six months' experience, but recently the average had been 45 per cent. Some thousands of operators had been taken away from the exchanges for war work, and there were still 800 of these highly skilled workers in the various Government departments. It was stated by various people that the shortage was due to their not paying sufficient wages. That was not so. Before the war girls of 18 were receiving 16s. per week, with a rise to 28s. Now they were started at 37s. 10d., and rose to 52s. 2d. When there were 1,000,000 calls per day in London before the armistice, there were now 1,250,000. There was delay, overolading, and confusion owing to the lines not being sufficient for the traffic, due to the lack of extension during the war. They were providing for all this, but it could not be done all at once. In London, since the armistice, they had put in 14,000 lines, and were at present installing 900 a week. They were putting in underground wires in 20 large towns, and establishing new exchanges and extensions all over the country. The new exchange at Clerkenwell, to be opened in December, would take 1,700 lines. There would also be new exchanges at Bishopsgate, the Tower Exchange, Holborn, Sloane Square, and Marylebone, and extensions to the Avenue, Exchange, Hampstead, Harrow, Hornsey, Battersea, Stratford, Tottenham, Victoria, and Waltham Cross exchanges. A Select Committee was to deal with telephone charges. As to the suggested committee of business men there were 51 in the country now, and one of them was established for London which represented the Chamber of Commerce, the Corporation, and the L.C.C. He had arranged some months ago to send experts to American to inquire into the telephone system there, and there were American experts in this country inquiring into our system. He added that he would consider the suggestion that one member of the National Union of Manufacturers should be selected to sit on the committee dealing with the London telephone service.

Referring to complaints made about the telegraph service, Mr. Illingworth said that, whilst mistakes were made, as they were made in every business, the British telegraph system was admitted to be the best in the world. The mistakes complained of would be inquired into. With regard to charges, the Government thought that, at any rate for the present, it was desirable to keep up communications as cheaply as possible, and really the Post Office was now being subsidised by the Treasury. He believed the deficit this year would not be less than two million pounds.

The Nitrogen Products Project.—At a meeting of the Derwent (Cumberland) Fishery Board, on the 13th inst., it was stated that the Nitrogen Products Co., which proposed to establish extensive works at Workington, and take water from the river Derwent, was not proceeding with the works owing to being unable to get a guaranteed coal supply. Mr. F. Hall (Mayor of Workington) read a letter, which stated that the company was not prepared to commit itself to any expenditure till a thousand tons of coal per shift were guaranteed.

Solar Eclipse and Wireless Reception.—In order to determine whether the reception of wireless signals would be affected by an eclipse of the sun, experiments were made during the recent eclipse of May 28th, as we announced at the time. According to the *Revue Générale de l'Electricite*, a special receiving station was erected at Meudon, and directed towards the transmitting station at Ascension. The signals were normally received during the night, but not during the day. During the eclipse, when the shadow of the moon passed between Ascension and Meudon, the signals were audible at Meudon, and as the shadow passed away the signals became weaker, and disappeared completely with the end of the eclipse.

The International Electrotechnical Commission.—As we go to press we learn that the plenary meeting of the Commission was held on Wednesday morning, with M. Maurice Leblanc in the chair, and a number of important decisions were taken regarding the work of the Commission. There are eight Advisory Committees, appointed or reappointed to deal with the various subjects, and meetings are to be held in the near future in order to prepare the preliminary details for the consideration of the Commission, which in all probability will meet in America next year. With the exception of the Advisory Committee on the Rating of Machinery, no meetings of the Committees are being held during the sessions of the Commission. The Rating Committee has made certain definite recommendations, which have been adopted.

The scope of the international rules is for the present to be confined to rotating machinery up to 750 K.V.A. capacity, and 5,000 volts pressure, or machines having a core length not exceeding 50 cm. The rules are to apply to all transformers, with the exception of the water-cooled type. In the former publications of the I.E.C. the method of presenting the temperature limits has been considered somewhat complicated, and extremely good work has been done, both at Paris and at meetings in London, towards their simplification; the temperature limit for silk has been added. The question of thermometer methods as against resistance methods was fully discussed at Wednesday's meeting, and in order to meet modern industrial conditions thermometers are to be permitted on certain definite conditions, but with a reduced temperature limit. The question of the temperature limit for commutators has received the attention of the Commission for a considerable time past. It is recognised that improved methods of manufacture have enabled certain makers successfully to employ commutators at much higher temperatures than formerly, and provision has been made that, whilst retaining a certain definite figure for the temperature limits of the commutator, by agreement these limits may be exceeded so long as the manufacturer expressly guarantees that the commutation will not thereby be impaired. This Special Committee has devoted several more days to continuing its extremely valuable work, as the Commission realises to the fullest degree the immense importance of the rating of electrical machinery to industrial companies.

Low C.P., H.V. Metal-filament Lamps.—A satisfactory solution to the problem of manufacturing metal-filament lamps of 10 C.P., or less, to run off 220-volt circuits is claimed to have been arrived at by two scientists working in the laboratories of Messrs. Pintsch, of Berlin. The lamp designed by them can be manufactured for a power consumption of only 1 to 5 watts and can be connected to any 220-volt network. It is provided with an ordinary lamp-bulb and a standard socket, and contains in a clear glass bulb a mixture of neon and helium gas at 8 to 10 mm. pressure. In this bulb is a large surface cathode, and, opposite it, an anode, placed at such a distance that at 190 volts pressure a discharge is set up which forms the luminous yield of the lamp. The remainder of the voltage is absorbed by a series resistance, the size of which is arranged to suit the current absorbed by the lamp. This resistance is concealed in the lamp socket. In order to change the colour of the light given from orange red to bright red, a little mercury vapour can be added to the gas charge.—*Technical Review.*

Decimal Coinage.—In connection with the Decimal Association's agitation for counting coins in tens, it is pointed out that already ten British Colonies have adopted decimal currency, namely, Canada, Newfoundland, British Honduras (dollar), Ceylon, Mauritius, East Africa (rupee-cent), British North Borneo, Straits Settlements (S.S. dollar of 2s. 4d.), Hong Kong (Mexican dollar), and Egypt (£E-millième). The last named is particularly interesting, for the Egyptian £ very closely approximates to our sovereign, and is divided into 1,000 millièmes, while Lord Southwark's Bill proposes to substitute 1,000 mils for our present 960 farthings.

Employment of Disabled Men.—The national scheme for the employment of disabled ex-service men has had a promising beginning, as we forecasted at the time of its inauguration. The scheme, full particulars of which can be obtained from any Employment Exchange, is that employers should undertake to employ as many discharged ex-service men as possible. Those who employ not less than 1 in 20 of their total number of workers are qualified to use on their stationery a special seal. Up to September 26th, 1,453 firms with a total of 172,031 employés, had been awarded the seal, and the applications of 2,637 other firms were under consideration.

A difficulty, which was to form the subject of discussion with Sir R. Horne this week, has arisen through the refusal, by vote, of the members of the Amalgamated Society of Engineers to co-operate with the Government in the scheme for training disabled men. Disabled soldiers training at Croydon as electrical workers under the Government scheme are protesting in the daily Press against the treatment which they allege they are receiving at the hands of the authorities. The men state that the Government is unable to place them in suitable employment, and, further, that it has suddenly decided to discontinue their training and subsistence allowances, and placed them, without notice, on the Labour Exchanges in competition with their more fortunate comrades. The men, it is understood, on completing six months in a technical school, should go to a workshop for another 1½ years' practical training. There appears to be some difficulty in obtaining the latter training for the men.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—Mr. H. P. STOKES, who is shortly taking up the position of general manager of the Plymouth Corporation Tramways, was entertained to a farewell dinner by the employés of the Bexley Council Tramways and Dartford Light Railways, at Vickers' Club, Crayford, on October 9th. Over 300 employés were present, and a very enjoyable evening was spent. Motorman Bareham, who occupied the chair, in proposing the toast to Mr. Stokes, spoke of the very happy relations whch had always existed between the manager and the employés, and Mr. A. Duly supported the toast. Mr. H. P. Russell, solicitor, who acted for over two years as an auxiliary motorman during the period of the war, presented the gifts, which had been subscribed to by the whole of the employés, to Mr. and Mrs. Stokes. Mr. Stokes was then presented with a clock in bronze and a pair of antique bronzes, and Mrs. Stokes with a massive pair of candlesticks and tea tray in solid silver. Mr. Stokes was also asked to accept a silver cup, given by the Borough of Woolwich, as a souvenir of the magnificently decorated and illuminated tramcar provided by him and the staff on the occasion of the peace celebrations. Mr. Stokes suitably replied. An illuminated album containing the signatures of those present at the dinner was handed to him.

Mr. RICHARDSON, general manager of Colne Tramways, is one of the selected candidates for the position of rolling stock superintendent for London County Council tramways—a position to which a salary of £1,000 per annum is attached. Mr. Richardson is also a selected candidate for the position of tramways general manager under the Stockton-on-Tees Corporation.

Mr. R. H. CAMPION, late electrical engineer at Dewsbury, who is going to Chesterfield, was presented, last week, with a travelling bag by the staff. The gift was handed over by his successor, Mr. R. W. Grubb, and the two oldest employés, Messrs. Jabez Auty and Frank Exley, spoke of the happy relationships between Mr. Campion and the workers during the past 18 years.

Mr. E. S. RAYNER, electrical engineer and tramways manager at Doncaster, on leaving to become city electrical engineer at Hull, has been presented by the staff with an eight-day striking clock, and by the chief officials of the Corporation with a silver fruit basket.

Mr. R. THOMSON, late of the L.C.C. Tramways, East Greenwich, and formerly of the Lancashire Electric Power Co., has been appointed, and has taken up his duties as resident engineer to the Yorkshire Electric Power Co., at Thornhill Power Station.

General.—The marriage has taken place at the Parish Church, Bispham, of Mr. S. THOMSON, electrical engineer, of Birkenhead, and Miss E. Wood.

Major GERALD THORPE, O.B.E., R.E., has been gazetted chief instructor in electricity at the School of Military Engineering, with effect from February 1st last. Major Thorpe joined the "Scientific Corps" in January, 1900, taking a very high place in his examinations, specialised in electricity subsequently, was promoted captain in 1909 and major in September, 1916. He was appointed an instructor at the School of Military Engineering (Electric Lighting) in August, 1910, and held that appointment with much ability till October, 1915, when his services were requisitioned for elsewhere. He served for a considerable time on the Royal Engineer Committee, and was mentioned in dispatches, and made a Member of the Order of the British Empire for his very valuable services.

The *Daily Telegraph* announces that Mr. J. P. THOMAS has been appointed assistant operating manager of the railways and 'buses of the London Underground Railways and the L.G.O. Mr. J. Thornton, chief inspector of the District Railway, becomes superintendent of the line to the District and Tube Railways, in place of Mr. W. E. Blake, deceased.

Lieut.-Col. A. SINCLAIR, M.I.E.E., A.M.Inst.C.E., for 15 years chairman of the Swansea Electricity Committee, and a popular delegate at conventions of the I.M.E.A., has been elected Mayor of Swansea.

Mr. A. ANDERSON, who resigned his position of chief en-

gineer to Edmundsons' Electricity Corporation, Ltd., in order to join Messrs. Banks, Warner & Co., Diesel engine experts, of 11, Queen Victoria Street, was presented with a silver cigarette box by the members of Edmundsons' head office staff. He will now be associated with Mr. P. H. Smith as joint managing director of his new company.

Colonel R. E. Crompton appeared before the Commission on Awards on Monday last to speak to his claim in connection with the evolution of the tanks. Asked whether he agreed that the tank was not an invention, the Colonel replied: "I think that if anyone succeeds in putting things together to perform new duties it is either a discovery or an invention. The tank was the result of several people working together, and of the work done my team claims no inconsiderable share." He invented the whole combination of parts which went to make the landship capable of travelling over rough ground. He was also responsible for altering the tracks in such a manner as to get over the War Office objections.

The Hon. A. Holland Hibbert has been appointed chairman of the North London Railway, in the place of the late Lord Rathmore.

Obituary.—Herr W. Von Siemens.—Herr Wilhelm von Siemens, chairman of Messrs. Siemens & Halske, passed away on October 14th at Arosa in Switzerland.

NEW COMPANIES REGISTERED.

Melrose Manufacturing Co., Ltd. (159,343).—Private company. Registered October 6th. Capital, £2,000 in £1 shares. Objects: To acquire the several connections of the Melrose Manufacturing Co., of 11, Beaumont Road, Acton Green, Middlesex, in the business of engineers and to carry on the business of mechanical and electrical engineers, machinists, electricians, &c. The subscribers (each with one share) are: F. Dickie, 24, Melrose Avenue, Wimbledon Park, S.W.19, engineer; J. H. Macdonnell, 3-7, Southampton Street, Strand, W.C., solicitor. The first directors are: G. A. Bassett, W. B. Sanderson, F. Thompson, J. Lawrence, and F. Dickie. Qualification, 25 ordinary shares. Registered office: 11, Beaumont Road, Acton Green, W.

F. W. Thomas Institute, Ltd. (159,399).—Private company. Registered October 8th. Capital, £1,000 in 500 15 per cent. cumulative preference shares of £1 each and 1,000 deferred shares of 1s. each. Objects: To carry on the business of electro-therapeutists, masseurs, teachers of physical culture, manicurists, chiropodists, beauty specialists, &c. The subscribers (each with one preference share) are: Mrs. E. D. Thomas, 70, Hampton Road, Redland, Bristol; F. W. Thomas, 25a, Whiteladies Road, Clifton, medical electrician. F. W. Thomas is permanent governing director, subject to holding £100 shares. Registered office: 25a, Whiteladies Road, Bristol.

Institute of Medical Electricity, Ltd. (159,405).—Private company. Registered October 8th. Capital, £1,000 in 500 15 per cent. preference shares of £1 each and 10,000 deferred shares of 1s. each. The objects are: To carry on the business of electro-therapeutists, masseurs, teachers of physical culture, dentists, manicurists, chiropodists, beauty specialists, &c. The subscribers (each with one preference share) are: Mrs. E. D. Thomas, 70, Hampton Road, Redland, Bristol; F. W. Thomas, 25a, Whiteladies Road, Clifton, medical electrician. F. W. Thomas is permanent governing director, subject to holding £100 shares. Registered office: 25a, Whiteladies Road, Clifton, Bristol.

Harland Engineering Co., Ltd. (159,403).—Private company. Registered October 8th. Capital, £100,000 in £1 shares. Objects: To take over the business (except the Canadian portion) of power engineers and contractors carried on at Manchester, Glasgow, London and elsewhere by F. C. Anderson, C. A. Atchley and F. G. Warburton as the "Harland Engineering Co." The subscribers (each with one share) are: F. C. Anderson, 196, Greengate, Manchester, electrical engineer; C. A. Atchley, Donbank, Stirling, engineer; F. G. Warburton, 1, Prebend Mansions, W.4, electrical engineer. The first directors are: F. C. Anderson, C. A. Atchley and F. G. Warburton (managing directors). Qualification, £1,000. Registered office: 196, Greengate, Manchester.

Comac Manufacturing Co., Ltd. (159,327).—Private company. Registered October 6th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers, repairers and vendors of and dealers in electrical and medical machinery, appliances, apparatus, plant, motor parts, accessories, and equipments, machinery of all kinds, clothing for aeronautical and motor purposes, &c. The subscribers (each with one share) are: C. Hellyar, 20, Clifton Road Norbiton, Surrey, electrical engineer; H. H. English, 92, Park End, Bromley, Kent, solicitor's clerk. The first directors are: C. Hellyar (chairman and managing director for life); J. W. O. Taylor, 27, Chatsworth Avenue, Wembley; and L. Mildenhall, 8, Hartington Road, Grove Park, Chiswick. Registered office: Ordnance Works, Gordon Road, Kingston-on-Thames.

Bodmin Electric Light and Supply Co., Ltd. (159,205).—Private company. Registered September 30th. Capital, £7,000 in £1 shares. Objects: As indicated by the title. Minimum cash subscription, £5,000. The first directors are: G. B. Treverton, Fore Street, Bodmin, cordwainer; J. C. Willis, Crockwell Street, Bodmin, licensed victualler; W. E. Bennett (chairman), Flora Terrace, Bodmin, builder; J. E. Bray, Honey Street, Bodmin, grocer; A. J. Bray, Helland Bridge, Bodmin, farmer; A. C. Hawke, Dunmere, Bodmin, miller; J. C. Jane, Crockwell Street, Bodmin, licensed victualler; F. Liddell, Wynnitun, Bodmin, stationer; E. A. Luke, Fore Street, Bodmin, baker; J. H. Pellow, Tregear, Bodmin, merchant. Qualification, £100. Secretary: E. W. Gill. Registered office: 45, Fore Street, Bodmin.

British Water Power Development Co., Ltd. (159,325).—Private company. Registered October 6th. £20,000 in 19,048 ordinary shares of £1 each and 19,040 deferred shares of 1s. each. Objects: To carry on the business of hydro-electric, electric and power engineers and contractors, &c. The subscribers (each with one share) are: D. Spencer, 1, Hall Place Gardens, St. Albans, Herts, commercial manager; Lieut.-Col. R. H. Mackenzie, D.S.O., M.C., 5, Gordon Road, Ealing, W.; W. Mulrhead, 8, The Ridgeway, Golders Green, N.W.; R. M. Wilson, Mill House, Blackheath, S.E., civil engineer. Directors: D. Spencer, Lieut.-Col. R. H. Mackenzie, D.S.O., M.C. (managing director), W. Muirhead, R. M. Wilson. Qualification, 50 shares. Secretary: W. F. Harwar. Registered office: 41, Parliament Street, S.W.1.

Swift Electrical Co., Ltd. (159,495).—Private company. Registered October 10th. Capital, £3,000 in £1 shares. Objects: To carry on the business of electrical merchants, suppliers of electric lamps and fittings, &c. The subscribers (each with one share) are: J. H. Butler, 14, Regent Square, W.C.1, shipping agent and merchant; H. E. Leigh, 145, St. Thomas Road, N.4, electrical engineer. The first directors are: J. H. Butler, H. E. Leigh and L. J. Evans. Secretary: H. E. Leigh.

Pearlite Electric Welding Co., Ltd. (159,299).—Private company. Registered October 3rd. Capital, £10,000 in £1 shares. To carry on the business of welders of steel, iron and other metals, mechanical and consulting engineers, &c., and to enter into agreements (a) with J. J. Heyes and R. T. Heyes & Co., Ltd. (of which company J. J. Heyes is managing director) whereby this company is to have a prior right to all the welding work of R. T. Heyes & Co., Ltd., for five years, in consideration whereof the said R. T. Heyes & Co., Ltd., may nominate one director and shall also be entitled, in any year during such period in which the gross amount earned by and paid to this company in respect of welding work directly received from R. T. Heyes & Co., Ltd., or customers thereof, amounts to at least £1,500, to receive a commission on the whole net profits of this company at the rate and subject to the provisions therein mentioned, and (b) a similar agreement with Charles Howson & Co., Ltd. The subscribers (each with one share) are: G. H. Fraser, 747, Royal Liver Building, Liverpool, iron merchant; J. J. Heyes, Moss House, Victoria Park, Wavertree, Liverpool, engineer; W. Barnes, 163, Regent Road, Liverpool, ship repairer. The first directors are: G. H. Fraser (chairman), J. J. Heyes (managing director), and W. Barnes (nominee of Charles Howson & Co., Ltd.). Registered office: 21, Dale Street, Liverpool.

Mada Engineering Co., Ltd. (159,475).—Private company. Registered October 10th. Capital, £15,000 in 4,000 deferred shares of 5s. each and 7,000 ordinary and 7,000 preference shares of £1 each. Objects: To carry on the business of electrical and mechanical engineers, iron and steel makers, manufacturers of engines, tools, machinery, railway, hydraulic, electric, pneumatic and other plant, manufacturers, builders and repairers of and dealers in iron buildings, roofs, bridges, and constructional iron work of all kinds, boats, barges and other craft, motor vehicles, &c. The subscribers (each with one share) are: E. Adamson, Melrose, The Park, Waterloo, near Liverpool, mechanical engineer; A. J. Davies, 37, Evered Avenue, Fazakerley, near Liverpool, patent agent and consulting engineer. The first directors are: E. Adamson (permanent managing director, subject to holding 1,000 deferred shares), A. J. Davies, and S. J. Adamson, 53, Salesbury Road, Cressington Park. Qualification of ordinary directors, 100 ordinary shares. Secretary: E. Adamson. Solicitor: E. V. Crooks, 14, Castle Street, Liverpool.

Mica Manufacturing Co., Ltd. (159,410).—Private company. Registered October 8th. Capital, £25,000 in £1 shares. To carry on the business of manufacturers, importers and exporters of and dealers in mica, micanite and insulating materials, paints, varnishes, papers and paper cloths, electric, magnetic, galvanic, chemical and other machinery, &c. The subscribers (each with one share) are: P. Freeman, 22½ Cazenove Road, N.16, manufacturer; G. H. Hadder, 22½, Cazenove Road, N.16, manufacturer. The first directors are: P. Freeman (managing director), T. J. Sack (works manager of Micanite department), and G. H. Hadder (works manager of Mica department), all permanent. Qualification, £500. Registered office: 22½ Cazenove Road, N.16.

Star Electrical Engineering and Manufacturing Co., Ltd. (159,320).—Private company. Registered October 4th. Capital, £10,000 in £1 shares. To carry on business as indicated by the title. The subscribers (each with one share) are: J. P. Beckett, 225, Grimsby Road, Cleethorpes, electrical engineer; G. W. Parker, "Rosedale," Abbey Drive, West Grimsby, merchant. The first directors are: J. P. Beckett (managing director), G. W. Parker, W. Rouston (Cliff Hotel, Cleethorpes), and A. Gidley (Elmdene, Weelsby Road, Grimsby). Secretary: J. P. Beckett. Registered office: 134, Victoria Street, Grimsby.

Victory Patents Syndicate, Ltd. (159,421).—Private company. Registered October 8th. Capital, £2,200 in 2,000 preference shares of £1 each and 4,000 ordinary shares of 1s. each. To acquire from L. A. de Becker the exclusive licence to manufacture and sell under certain existing letters patent and provisional specification for invention relating to (a) an electric lamp, (b) an electric switch, and (c) a gramophone record filing cabinet. The subscribers (each with one share) are: L. A. de Becker, 54, Great Tower Street, E.C., engineer; C. Kyriakidis, 54, Great Tower Street, E.C., merchant. The first directors are: L. A. de Becker and C. Kyriakidis (both permanent governing directors). Registered office: 54, Great Tower Street, E.C.

Hollinwood Electric Light and Power Co., Ltd. (159,575).—Private company. Registered October 14th. Capital, £3,000 in £1 shares. Objects: To take over the business of an electrical engineer and supplier carried on by S. L. Stapleton at Hollinwood, Oldham, as "S. Stapleton." The subscribers (each with one share) are: S. L. Stapleton, 10, Incline Road, Hollinwood, Oldham, electrical engineer; J. Fidler, 771, Hollins Road, Hollinwood, Oldham, electrician. S. L. Stapleton is permanent director. Qualification, £350. Registered office: 205, Manchester Road, Hollinwood, Oldham.

Evans, Dewhurst & Colley, Ltd. (159,568).—Private company. Registered October 14th. Capital, £5,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, manufacturers and workers of and dealers in electricity and motor power light, &c. The subscribers (each with one share) are: W. J. Thomas, Newton House, Newton, Porthcawl, consulting engineer; W. B. Dewhurst, 20, Moathermer Road, Cardiff, electrician engineer. The first directors are: W. J. Thomas (chairman), D. J. Evans, W. B. Dewhurst and A. H. Colley (all permanent). D. J. Evans and W. R. Dewhurst are joint managing directors. Solicitor: T. John, 1, Castle Street, Cardiff.

Wallace-Griffin Electrical Co., Ltd. (159,636).—Private company. Registered October 15th. Capital, £2,000 in £1 shares. To take over the business of electrical and mechanical engineers carried on by G. Wallace and T. R. Griffin at 58, High Street, Bloomsbury, as "Wallace & Co." The subscribers (each with one share) are: G. Wallace, 58, High Street, Bloomsbury, engineer; T. A. Griffin, 69, Foxbourne Road, Balham, S.W.17, electrical engineer. The first directors are: G. Wallace and T. A. Griffin (both permanent). Solicitor: H. M. Parry, Avenue Chambers, Vernon Place, W.C.

Feuerheerd's Rotors (British Empire), Ltd. (159,606).—Private company. Registered October 16th. Capital, £240,000 in £10 shares. Objects: To take over an invention relating to rotary engines and pumps, air compressors, and the like, for use within the British Empire, and to enter into agreements (a) with Feuerheerd's Rotors, Ltd., (b) between Feuerheerd's Rotors, Ltd. (as trustees for this company) and Stothert and Pitt, Ltd., (c) between Fielding and Platt, Ltd., and Feuerheerd's Rotors Ltd. (on behalf of this company). The first directors are: E. M. Feuerheerd, 50, Lower Oldfield Road, Bath, and C. F. K. Quack, 12, Hackins Hey, Liverpool (both British by birth). Registered office: New Bridge Street House, E.C.

Vickers-Orient, Ltd. (159,684).—Private company. Registered October 16th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in steel, iron, brass, and metals of all kinds, shipbuilders, and shipwrights, electricians, &c. The subscribers (each with one share) are: F. J. Abbott, 147, North View Road, N.8, clerk; E. J. Alldis, 18, Macdonald Road, Forest Gate, E.7, clerk. The first directors are to be appointed by the subscribers. Registered office: Vickers House, Broadway, Westminster, S.W.

Vickers-New Zealand, Ltd. (159,523).—Private company. Registered October 11th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in steel, iron, brass, and metal of all kinds, shipbuilders and shipwrights, &c. The subscribers (each with one share) are: F. J. Abbott, 147, North View Road, Hornsey, N.8, clerk; E. J. Alldis, 18, Macdonald Road, Forest Gate, E.7, clerk. The first directors are to be appointed by the subscribers. Qualification, £200. Solicitors: Linklater & Co., 2, Bond Court, Walbrook, E.C. Registered office: Vickers House, Broadway, Westminster, S.W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Power Engineering Co., Ltd.—Issue on August 14th, 1919, of £1,000 debentures, part of a series already registered.

Rushmore's, Ltd. (Formerly Rushmore's Lamps, Ltd.).—Charge on the company's undertaking and property, present and future, including uncalled capital, dated August 6th, 1919, to secure £1,002 and any other sums advanced by British Safety Blades, Ltd.

Newton's, Ltd. (Formerly Newton Electrical Works, Ltd.).—Satisfaction in full registered August 20, 1919, of charge for £1,000. Registered February 26th, 1912.

Whitchurch and Pangbourne Electric Supply Co., Ltd.—Charge on the company's undertaking and property, present and future, including uncalled capital, registered August 25th, 1919, to secure £300. Holder: P. F. Ferguson, Ingleside, Blackwater, Hants, and another.

Hong-Kong Tramway Co., Ltd.—Satisfaction registered August 22nd, 1919, of £129,900, balance of £195,000 registered July 9th, 1903.

Wardle Engineering Co., Ltd. (102,714).—Return dated December 31st, 1918 (filed July 22nd, 1919). Capital, £5,000 in 3,000 ord. and 2,000 pref. shares of £1 each. All shares taken up. £4,800 paid. £200 considered as paid. Mortgages and charges, nil.

Union Cable Co., Ltd. (67,054).—Return dated August 7th, 1919. Capital, £50,000 in £1 shares. All shares taken up and paid for in full. Mortgages and charges nil.

Newcastle-on-Tyne Electric Supply Co., Ltd.—Mortgage on freehold land at Billingham, Durham, with 73 messuages and other buildings in course of erection. Registered September 6th, 1919, to secure £40,150. Holders: Grainger Permanent Building Society, Newcastle-on-Tyne.

Weldings, Ltd.—Satisfaction in full registered September 1st, 1919, of charge for £200, registered July, 1910.

Unelma, Ltd.—£3,000 debentures charged on the company's undertaking and property, present and future, including uncalled capital, registered August 29th, 1919.

Pritchett and Gold and Electrical Power Storage Co., Ltd.—(*a*) Satisfaction in full, registered August 21st, 1919, of charge for £10,000, registered August, 1919. (*b*) Satisfaction in full registered August 26th, 1919, of all moneys due under charge, registered May 26th, 1916.

Faringdon Electric Light and Power Co., Ltd.—W. A. Henderson, of 29, Gracechurch Street, E.C., ceased to act as receiver on August 8th, 1919.

CITY NOTES.

British Internal Combustion Engines, Ltd.—The report for the period ended June 30th, 1919, states that the net revenue amounts to £14,954. The company is paying a total of 7½ per cent. on the cumulative preference shares and 5 per cent. on the ordinary shares for its first year, and as these dividends are paid free of income tax up to 5s. in the £ they are equivalent to £9 7s. 6d. per cent. on the cumulative preference shares and £6 5s. per cent. on the ordinary shares. The Aster Engineering Co. (1913), Ltd., and the Green Engine Co., Ltd., with which this company is associated, and from which its revenue is derived, have been very successful. The profits shown would have been very much increased had the sub-contractors of these companies completed the engines on order which should have been delivered within the period under review.

Nairobi Electric Power & Lighting Co., Ltd.—Shareholders have been advised that the ending of the war having made it possible for the company to procure further machinery and plant required to meet local needs at Nairobi, orders were duly placed, and the goods are now in course of shipment, although great delay was caused by unfavourable trade conditions. The expenditure will be approximately £10,000; the greater part is being paid for out of revenue, but a further issue of shares, not to exceed £5,000, in part payment of same, is to be made. These are now offered to shareholders. Applications are to be sent in by November 3rd.

Automatic Telephones (Australasia), Ltd.—For the year ended June 30th there was a profit of £6,375. Dividend 10 per cent. payable as to 5 per cent. in August and as to 5 per cent. in February. Work in progress and sundry debtors stand at £32,912, represented mainly by unfinished work at City North Exchange, Sydney, and balances owing by the New Zealand Government for Christchurch and Wanganui exchanges. The Malvern exchange in Victoria had been completed to the department's satisfaction. City North is expected to be in operation in October.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted:—

Aluminium Corporation, Ltd.—£206,325 ordinary stock and £219,512 preference stock.

The Committee has ordered the undermentioned to be officially quoted:—

London United Tramways, Ltd.—962,841 5 per cent. preference shares of £1 each, fully paid, Nos. 1 to 962,841.

Shanghai Electric Construction Co., Ltd.—An interim dividend at the rate of 6 per cent. actual, less tax, has been declared.

Callender's Cable & Construction Co., Ltd.—Interim dividend 5s. per share, less tax, on the ordinary shares.

Parsons Marine Steam Turbine Co., Ltd.—Dividend of 15 per cent., free of tax, for the half-year, making 25 per cent. for the year.

The Danish Siemens-Schuckert Co.—The annual meeting of the Dansk A.S. Siemens-Schuckert was held on October 2nd, when a dividend at the rate of 10 per cent. was declared for 1918-19 on the share capital of 900,000 kronen. The report stated that the value of the turnover amounted to 3,317,000 kronen, and the net profits were 188,000 kronen, the prospects for the new year being regarded as favourable. Among the directors appear the names of Carl Frederick von Siemens and Dr. von Winterfeld.

Brampton Bros., Ltd.—Net profit for the year £23,311, plus £9,761 brought forward. After paying 6 per cent. on the preference shares, and 10 per cent., free of tax, on the ordinary, £15,000 is put to reserve and £9,672 carried forward.

Electrical Utilities Corporation, Ltd.—Quarterly dividend of 1¼ per cent. on the preferred shares for the September quarter.

United River Plate Telephone Co., Ltd.—Interim dividend of 3 per cent. on the ordinary shares, free of tax, for the June half-year.

Indo-European Telegraph Co., Ltd.—Interim dividend for the June half-year at the rate of 5 per cent. per annum, free of tax.

Anderston Foundry Co., Ltd.—Interim dividend of 3s. per share, less tax, for the half-year.

Calcutta Tramways Co., Ltd.—Interim dividend of 3½ per cent., free of tax, on the ordinary shares.

Prospectus.—*Indian Electric Supply and Traction Co., Ltd.*—The list of applications will close on or before Wednesday next in an issue of 120,000 seven per cent. non-cumulative convertible preference shares of £1 each, at par. A new power station (20,000 KW. ultimate) is to be put up and 6,000 KW. installed to meet immediate demands for industrial power.

STOCKS AND SHARES.

Tuesday Evening.

The opening of Parliament this week had a sobering effect upon the optimism that had distinguished Stock Exchange markets after the settlement of the railway strike. People began to ask whether there was any chance of a capital levy, forced loan, or other sharp reminder of the fact that even the United Kingdom cannot indefinitely pursue the slippery path that leads to financial bankruptcy. What financial legislation there may be in store is certain not to be of the pleasant type, and, accordingly, investors and others with money are holding their hands.

Many of the industrial companies which have recently distributed part of their reserve funds are deemed to be wise, having regard to the possibility of raids upon such appropriations. In the case of other undertakings which have not followed this financial policy, rumour is busy with the chances of their coming into line before long. The new issue of Babcock & Wilcox shares are now negotiable, and the price, which opened at 10s. premium, was rapidly advanced to 17s. 6d. premium. Industrials of all kinds continue to attract attention, and there is renewed demand for electricity supply shares. The effect of this is noticeable in several directions. Jobbers in the market say that they have buyers for Chelseas, Charing Cross, Westminsters, Metropolitans and others. There are a number of improved quotations in the lists. Metropolitan ordinary stiffened to 3¼, Charing Cross ordinary to 3½, Westminsters, which were 5 the other day, are now 5¾. On the other hand, Urban preference declined to 35s. Newcastle-on-Tyne preference are a little easier at 16s. 6d. Edmundson's ordinary are 5s. 6d. buyers, and the non-cumulative preference can be placed in the Stock Exchange at 15s. 6d. A correspondent says that he has just lately received a letter bidding him 4s. for the ordinary and 10s. for the preference, this from an outside house. It is to be hoped that holders of the shares will not throw them away at prices so substantially lower than those which rule in the Stock Exchange market.

Vera Cruz Electric shares are a little dull at 18s. 6d., on account of the declaration of a final dividend of 2½ per cent., against the 5 per cent. declared as an interim dividend six months ago. This is regarded as putting the cart before the horse, and another point which claims attention in the report is the matter of depreciation. Possibly, the meeting will afford further information on this head. Mexicans are generally out of favour, and the preferred shares of the Mexican Light and Power Co. shed 13 points to 32½. The various bonds of the American, Canadian, and South American utility companies are ¼ to a point lower, but there is not much business doing in any of them. Brazilian Tractions have parted with most of their last week's rise, and British Columbia preferred is heavy at 44½, although the debenture stock has risen a little.

The prospectus of the Indian Electric Supply and Traction Co., offering 7 per cent. non-cumulative preference (convertible) shares at £1, is expected at the end of the week. Details were given here a month ago, and the issue may be before the public about the same time as these notes are.

The cable market is again better. Eastern Extension shares have risen to 16, Westerns to 16¾, Globes to 15¾. With the prospect of increased taxation in some shape or another, the public is again demanding shares the dividends on which are

paid free of income tax, and so strong is the financial position of most of these cable undertakings that a departure from their usual practice of paying dividends free of tax is not expected.

Marconis are a lively and buoyant market. The price rose to 6, and various rumours were circulated to account for the strength, the most popular one being that a new issue of shares is in contemplation that shall provide a handsome bonus for the proprietors. Americans hardened to 33s., Canadians to 16s. 9d., and Marconi Marines, after being 3, picked up to 3¼.

Metropolitan consolidated is ½ higher at 25½, and Districts gained 1½ at 23. No changes have occurred in the other Undergrounds. Metropolitan-Vickers preference at 3 are ½ lower. Manufacturing shares are good as a whole. There is quiet buying of British Aluminium from Scotland, and gossip says that the company is doing extremely well. India-Rubber shares have risen 10s. to 17½ for the same reason as applies to the strength of the Cable group. Edison-Swan ordinary are harder at 25s. Babcock & Wilcox regained the dividend of 1s. 2½d. deducted last week. General Electrics maintain their improvement, and English Electrics are a firm market. What appears to be the last stand of the Bolshevists in Russia is hailed in the Stock Exchange as an encouragement to the hope that this poison-gas movement is likely now to die away throughout the industrial world, ensuring peace, production and progress to the commercial community.

Rubber shares continue to exhibit a rising tendency, business broadening out in steady fashion to the accompaniment of higher prices. There is not much going on amongst armament shares, and what few fluctuations occur in the engineering list are fairly equally divided between small rises and declines.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price Oct. 21, 1919.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	8	6	—	£6 13 4
Charing Cross Ordinary	4	4	8⅛	+ ½	6 8 0
do. do. do. 4½ Pref.	4½	4½	8	—	7 10 0
Chelsea	5	3	8	—	5 0 0
City of London	8	8	11¼	— ¼	7 2 10
do. do. 6 per cent. Pref.	6	6	9⅞	+ ¼	6 2 9
County of London	7	7	9⅞	+ ⅛	7 5 5
do. do. 6 per cent. Pref.	6	6	9⅛	—	6 11 9
Kensington Ordinary	7	6	4⅞	—	6 6 4
London Electric	Nil	Nil	1½	—	Nil
do. do. 5 per cent. Pref.	5	6	8¼	—	8 11 6
Metropolitan	4	5	8½	+ ¼	7 13 10
do. 4½ per cent. Pref.	4½	4½	8⅛	—	7 1 2
St. James' and Pall Mall	9	10	6⅝	—	8 8 4
South London	5	5	2⅛	—	7 8 6
South Metropolitan Pref.	7	7	1	—	7 0 0
Westminster Ordinary	9	8	7⅞	+ ½	7 2 2
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	94½xd	—	6 7 0
do. Def.	1½	33/6	22½	—	7 9 0
Chile Telephone	8	8	6⅞	—	5 16 6
Cuba Sub. Ord.	7	7	10½xd	+ ½	*6 13 4
Eastern Extension	8	8	16	+ ½	*5 0 0
Eastern Tel. Ord.	8	8	160½xd	+1	*4 19 8
Globe Tel. and T. Ord.	7	8	15⅞	+ ½	*5 1 3
do. do. Pref.	6	6	10⅞	—	5 17 1
Great Northern Tel.	22	22	29	—	7 11 9
Indo-European	13	13	4⅛	—	6 16 10
Marconi	20	25	6	+ ⅛	4 8 4
Oriental Telephone Ord.	15	10	94xd	—	4 14 1
United R. Plate Tel.	8	8	7⅛	—	*5 1 7
West India and Panama	1/3	1/3	1/16	—	*4 18 3
Western Telegraph	8	8	10⅞	+ ⅛	*4 15 6
Home Rails.					
Central London Ord. Assented	4	4	80½	—	5 13 1
Metropolitan	1	1½	26½	+ ½	4 18 0
do. District	Nil	Nil	24	+1½	Nil
Underground Electric Ordinary	Nil	Nil	5⅞	—	Nil
do. do. "A"	Nil	Nil	p.	—	Nil
do. do. Income	4	5	94	—	*5 6 5
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4⅛	—	5 18 4
Anglo-Arg. Trams. First Pref.	5⅛	Nil	8⅛	—	—
do. do. 2nd Pref.	—	—	9⅞	—	—
do. do. 5 Deb.	5	5	66⅞	+ 1¼	7 10 6
Brazil Tractions	—	—	59½	−1½	—
Bombay Electric Pref.	6	6	134	—	4 18 0
British Columbia Elec. Rly. Pfce.	5	5	86½	—	5 17 0
do. do. Preferred	Nil	2½	44½	- 2	5 7 0
do. do. Deferred	Nil	Nil	39½	—	Nil
do. do. Deb.	4½	4½	61⅛	+ ⅛	6 18 3
Mexico Trams 5 per cent. Bonds	Nil	Nil	49	−1	Nil
do. 6 per cent. Bonds	Nil	Nil	40½	—	Nil
Mexican Light Common	Nil	Nil	89½	—	Nil
do. Pref.	Nil	Nil	82½	−13	Nil
do. 1st Bonds	Nil	Nil	59⅛	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	94xd	+ ⅛	*4 16 0
British Aluminium Ord.	10	10	13	+ ⅛	5 14 4
British Insulated Ord.	25	12½	2⅛	—	5 19 4
Callenders	25	25	8½	—	7 2 10
do. 6½ Pref.	5	6½	3⅛	—	6 6 10
Castner-Kellner	25	20	27	—	8 0 0
Crompton Ord.	7	10	21/6	—	9 6 0
Edison-Swan, "A"	—	—	1½	+ ⅛	6 0 0
do. do. 5 per cent. Deb.	4	5	81½	—	6 2 9
Electric Construction	10	10	1⅛	—	8 18 0
Gen. Elec. Pref.	6	6½	27/8	—	5 6 10
do. Ord.	10	10	2	—	*5 0 0
Henley	25	25	2½	—	5 11 1
do. 4½ Pref.	4½	4½	8⅛	—	5 4 2
India-Rubber	10	10	17½	+ ½	*5 14 3
Met.-Vickers Pref.	—	—	3	— ⅛	5 6 8
Siemens Ord.	—	10	1⅜	—	*7 5 4
Telegraph Con.	20	20	25	—	*4 17 0

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Tuesday, October 21st.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/5	..
a Ammoniac Sal	per ton	£80	..
a Ammonia, Muriate (large crystal)	"	£68	£10 dec.
a Bisulphide of Carbon	"	..	..
a Borax	"	£90	..
a Copper Sulphate	"	£41	£1 dec.
a Potash, Chlorate	per lb.	1/1	..
a " Perchlorate	"	1/3	..
a Shellac	per cwt.	£24	10s. dec.
a Sulphate of Magnesia	per ton	£15	..
a Sulphur, Sublimed Flowers	"	£28	..
a " Lump	"	£25	..
a Soda, Chlorate	per lb.	7d.	1d. dec.
a " Crystals	per ton	17½/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
g Babbitt's Metal Ingots	per ton	£88 to £292	..
c Brass (rolled metal 2' to 12' basis)	per lb.	1/1½	½d. inc.
c " Tubes (solid drawn)	"	1/8½ to 1/9½	½d. inc.
c " Wire, basis	"	1/2½	½d. inc.
c Copper Tubes (solid drawn)	"	1/7½	½d. inc.
g " Bars (best selected)	per ton	£149	£3 inc.
g " Sheet	"	£14s	£s inc.
g " Rod	"	£149	£3 inc.
d " (Electrolytic) Bars	"	£122	£2 inc.
d " Sheets	"	£156	£2 inc.
d " Wire Rods	"	£130	£2 inc.
d " H.C. Wire	per lb.	1/4½	½d. inc.
f Ebonite Rod	"	3/-	..
" Sheet	"	2/6	..
n German Silver Wire	"	2/5	..
h Gutta-percha, fine	"	10/- to 11/-	..
h India-rubber, Para fine	"	3/6	..
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£42	..
g Lead, English Pig	"	£30 5	50/- inc.
g Mercury	per bot.	£16 15	50/- dec.
e Mica (in original cases) small	per lb.	2s. to 4/6	..
e " " " medium	"	5/- to 10/-	..
e " " " large	"	12/6 to 25/- & up.	..
g Phosphor Bronze, plain castings	"	1/6 to 1/9	½d. to 1½d.
g " " rolled bars & rods	"	2/- to 2/4	.. [inc.
g " " rolled strip & sheet	"	2/1 to 2/6	..
d Silicium Bronze wire	per lb.	1/9	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	£280 to £281	£1 dec.
n " Wire, Nos. 1 to 18	per lb.	4/3	..
White Anti-friction Metals	per ton	£60 to £292	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

"Efficiency" in Ireland.—At a meeting of the City of Cork Technical Instruction Committee recently the appointment of a whole-time teacher of electrical engineering, at a salary of £180 a year, and war bonus, was the principal business, and there was a full attendance of the members. Five candidates applied for the position; their names and qualifications were given in the report thus: Mr. McIlwraith, fully qualified; Mr. Healy and Mr. Murphy, apparently qualified; Mr. O'Brien and Mr. Barry, not qualified. The voting resulted: For O'Brien 16 votes; McIlwraith, 10; Barry, 3; Healy, 0; Murphy, 0. Mr. O'Brien having received a clear majority was declared elected—that is to say this Technical Instruction Committee elected one of the two candidates declared not to be qualified to fill the position, and the only candidate found to be "fully qualified" was defeated. It was mentioned that the class was experimental, and the position might terminate at the end of 12 months. To comment on the sagacity of the committee would be superfluous.

Unjustifiable Claims to Institution Membership.—In a public notice which appeared in a recent issue of a prominent engineering journal, the secretaries of the Institution of Municipal Engineers and the Institution of Water Engineers point out that on a recent occasion an application for an appointment as surveyor to an Urban District Council contained a statement which distinctly implied that the applicant had been admitted to membership of the institutions in question, whereas that was not the case. This notice, issued not only in the interests of the technical institutions themselves, but in those of the public also, seems to us to be of considerable importance. Similar unjustifiable claims to membership of technical institutions are not entirely unknown to us, and it would seem very desirable that all technical institutions should adopt the course taken by the two institutions in question, which offer to verify any claims to membership made by applicants for public appointments. Were this procedure adopted in all, not merely public, appointments the results would be still more to the benefit of all concerned.

THE IMPROVEMENT OF POWER FACTOR.

By E. W. DOREY.

(*Continued from page* 485.)

The second method of charging has been adopted by many supply undertakings, mainly for the larger loads, *i.e.*, 30 K.V.A. and upwards, and has a very marked effect in inducing the consumer to improve the power factor of his load. Many undertakings base the rental charge on the demand in KW., which is obviously not sound.

The cost of A.C. plant, such as generators, cables, transformers, switchgear, &c., is approximately proportional to the K.V.A., and not to the KW. capacity. There are, of course, certain portions of the generating plant which are practically independent of power factor, such as prime movers and their condensers, boiler plant and auxiliaries; but on the whole a rental charge based on demand in K.V.A. is fully justified, provided that :—

1. The charge per K.V.A. is one that takes care of both the KW. and K.V.A. factors.

2. The instrument to record the K.V.A. demand is an accurate one.

Dealing with point 1, it will be seen that the rental charge per K.V.A. of demand must be made up of two component charges, as follows :—

(*a*) The first component based on that portion of the plant which is unaffected by power factor.

(*b*) The second component based on that portion of the plant which is affected by power factor.

Component (*a*) would not vary for any range of power factor, but component (*b*) must increase as the power factor falls. The relative proportions of (*a*) and (*b*) must be determined for each particular undertaking, as these will vary according to the nature and value of the distribution system and generating plant; *e.g.*, in one case the capital expended on distribution mains, &c., outside the power station may be 40 per cent. of the total capital, and in another 60 per cent., and so on.

The following example will illustrate the point :—

Let X represent the first component, unaffected by power factor.

Let Y represent the second component, depending upon power factor.

Let Z be the total charge per K.V.A. of maximum demand per quarter, being the sum of X and Y.

Power factor.	X. s. d.	Y. s. d.	Z. s. d.
Exceeding 95%	7 0	7 0	14 0
90% to, but not exceeding, 95%... ...	7 0	7 6	14 6
85% to, but not exceeding, 90%... ...	7 0	8 0	15 0
80% to, but not exceeding, 85%... ...	7 0	8 6	15 6
75% to, but not exceeding, 80%... ...	7 0	9 0	16 0
70% to, but not exceeding, 75%... ...	7 0	9 6	16 6
65% to, but not exceeding, 70%... ...	7 0	10 0	17 0

Although without a graduated scale such as this, the consumer would be penalised for low power factor, there is also the question of increased losses in transmission and KW. capacity of plant rendered idle due to very low power factor to be considered, and this justifies the graduated charge whereby the consumer is relatively the more heavily penalised the lower the power factor.

It is useless to suggest a method of charging consumers without ensuring that accurate meters can be provided, and this brings us to point 2.

The registration of the B. of T. units would be effected by the ordinary KW.-hour meter, but for the registration of the maximum demand in K.V.A. the following instruments may be used :—

(*a*) A maximum-demand electrolytic indicator (Reason type).

(*b*) A maximum-demand hot-wire ammeter.

(*c*) An integrating meter registering in K.V.A.-hours with lagging power factor, and fitted with a maximum-demand attachment to record the demand in K.V.A. over a time period of, say, 15 minutes.

With instruments (*a*) and (*b*) the supply voltage must be taken as constant, and there is also the objection of the time lag of these instruments. The electrolytic indicator, which has a time lag approaching the average over a period of 15 minutes, on the whole gives satisfactory results on the smaller loads.

Instrument (*c*) is, however, the most suitable, as it gives a true record of the demand in K.V.A. on single, two, or three-phase loads, whether balanced or not. Several instruments of this type are in use in installations with which the writer is acquainted. In appearance and construction they are similar to KW.-hour meters, but the windings are displaced so as to give at any moment a true reading in K.V.A.-hours within the accuracy range of the meter, usually 70 per cent. to 95 per cent., or 75 per cent. to 100 per cent., according to requirements. The instrument integrates the K.V.A.-hours and is provided with a maximum-demand indicator to record the K.V.A. demand over a period of 15 minutes, or any other period. To record the consumption in B. of T. units, it is necessary to install a standard KW.-hour meter.

A metering equipment of this description would, therefore, consist of the following :—

Integrating K.V.A. meter with demand attachment.

Integrating KW.-hour meter with, or without, demand attachment.

Control clock, or resetting switch, to govern both instruments.

Current transformers.

Fig. 3 illustrates such an equipment installed in a large war factory in the South of England, made by Landis and Gyr, Ltd.

The charges for supply would be based on the demand reading of the K.V.A. instrument and the energy reading of the watt-hour meter. By the addition of a maximum-demand attachment on the KW. meter some approximate idea of the power factor can be obtained, and a comparison of the integrations of the two meters will give a similar result.

Fig. 3.—Power Factor Metering Equipment.

With a leading power factor the K.V.A. meter (*c*) will run slow, and, therefore, a consumer will not be penalised if the power factor leads instead of lags. Where rotary converters or condensers are installed, and the power factor is likely to have a leading value at times of peak load, it is essential that the KW.-hour meter be fitted with a demand indicator to record the demand in KW. as, say, at 90 per cent. leading power factor, the K.V.A. instrument would give a reading considerably less than the equivalent of the demand in K.V.A. or KW.

A set of instruments as described above has been installed at a consumer's sub-station containing rotary converters. The power factor is usually unity, but

occasionally leads and lags, and the performance of the instruments under these conditions is excellent.

These remarks should suffice to show that the consumer should be responsible for the improvement of power factor, but there is the case of numbers of small consumers on one main or sub-station to be contended with, and in such a case the only practical solution is for the supply undertaking to install one or more condensers of reasonably large size, disposed at either one or more consumers' premises at various points, or in the sub-station itself. The supply undertaking might then endeavour, as far as possible, to obtain an adequate return on the capital outlay by the methods of charging referred to in the foregoing.

4. Methods of Improving the Power Factor.

There is a practical limit above which the power factor of the ordinary industrial A.C. load cannot be raised without resorting to the installation of apparatus to improve the power factor. With a factory load of, say, 500 KW., composed of motors ranging from 5 to 100 H.P., the majority being under 50 H.P., it will be found that, even with the best arrangement of drives, &c., the power factor is not, in most cases, higher than 82 per cent.; many loads fall much below this. For reasons which will be explained later, it is not sound practice to install plant to improve the power factor above 95 per cent.

Inasmuch as the wattless lagging current, creating the power factor, is attributable to the induction motor itself, it follows that the improvement in power factor should be effected as near the point of consumption, *i.e.*, the motors, as is practicable. It will be found that in the majority of cases the power-factor rectifying plant is best connected direct across the bus-bars of the main power distribution board in the consumer's distribution chamber. In the case of large loads of, say, 1,000 KW., or more, it will often be found advisable to split up the condenser capacity into several units, arranged at the various points of sub-distribution, and thus reduce the section of the distribution feeders. It is, however, quite impossible to draw any hard-and-fast rule, as each case must be considered on its own merits.

Improvement of the power factor may be effected by the following methods:—

1. The substitution of synchronous motors for induction motors, where possible.
2. The installation of rotary converters or generators driven by synchronous instead of induction motor-generators.
3. The installation of power-factor rectifiers.

Many works are, at the present time, supplied with D.C. power by means of induction motor-generators taking public A.C. supply, and to replace these by rotary converters would not only about halve the efficiency loss, but would also improve the power factor to unity. Then, again, in other works both A.C. and D.C. supply is required, and for this purpose when public A.C. supply is taken induction motor-generators are installed; these sets if replaced by rotary converters could be made to improve the power factor of the converted D.C. load to unity, and in addition by over-exciting the rotaries to correct the power factor of a part or the whole of the direct A.C. load.

The first two methods have a somewhat limited application, but Method 3 offers very considerable scope for development.

Power-factor rectifying plant may be divided into three classes, as follows:—

(*a*) A phase advancer of the vibrator or of the rotary type operating in conjunction with a slip-ring induction motor.

(*b*) A rotary condenser.

(*c*) A static condenser.

Briefly, the phase advancer of the vibrator type needs separate excitation, and is, for all practical purposes, confined to employment with large slip-ring induction motors: its efficiency is high. The phase advancer of the rotary type does not need separate excitation, but must be belt or otherwise driven from the motor for which power-factor improvement is required. The rotary condenser is, for all practical purposes, confined to power-factor correction on a large scale, and has the objection that the efficiency loss is considerable. All the foregoing need considerable attendance and maintenance, whereas the static condenser needs no attendance, and practically no maintenance, has a very high efficiency, and is equally adaptable to small as to large loads.

(*a*) *Phase Advancers.*—Phase advancers are installed to work in conjunction with asynchronous, slip-ring, induction motors, and fall into two classes, as follows:—

1. The Kapp phase advancer of the vibrator type.
2. The rotary advancer.

1. The Kapp phase advancer is built in this country by Messrs. J. H. Holmes & Co. and the G.E. Co., Ltd., and has much to recommend it, being of substantial construction and efficient in operation; it is illustrated in fig. 4.*

The operation of this machine depends upon the fact that a conductor carrying alternating current in a magnetic field tends to move, and in moving has induced in it an E.M.F. which leads the current in the conductor by 90°. If the rotor current of an induction motor, therefore, be sent through a conductor situated in a steady magnetic field, the conductor will oscillate with a frequency depending on the slip of the motor. The leading E.M.F. which is generated in the oscillating conductor is thus injected into

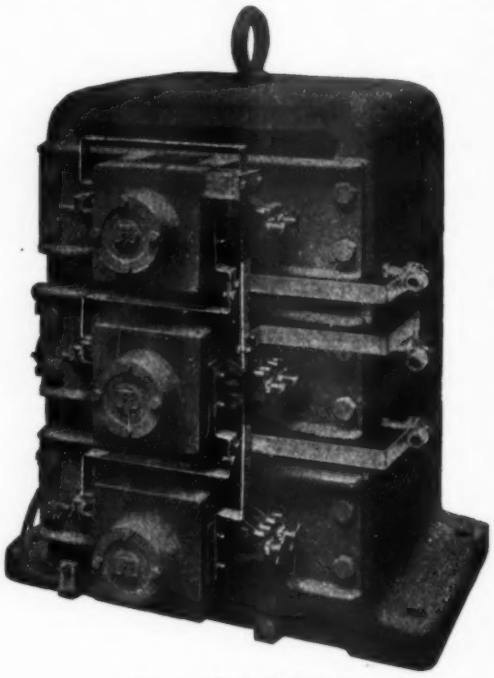


Fig. 4.—Kapp Vibrator.

the rotor circuit and supplies the magnetising current, which would otherwise be provided by the supply current circulating in the windings of the stator, and thus the motor runs at unity power factor. The injected E.M.F. does not fall off proportionately with the load, but at a much lower rate, with the result that the effect of the phase advancer is relatively greater at low loads, which is just what is wanted, the motor running at unity power factor over a wide range of load—from about one-third full load to 25 per cent. over load. It is also possible to design the machines so as to take a leading current from the mains.

The Kapp vibrator consists of three D.C. armatures oscillating in two-pole fields, the excitation of which requires a supply of direct current, amounting to about 0·5 per cent. of the output of the motor. The rotor leads are directly connected to the armatures, and the latter are mesh-connected.

2. The rotary phase advancer is made in this country by the British Westinghouse Co. (Metropolitan-Vickers),† but does not appear to have been used to any great extent. This advancer is for use in conjunction with a slip-ring induction motor, and may be driven from the latter by belt, or in any other convenient way; the power factor can

* See Electrical Review, Vol. 72, p. 784.
† See Electrical Review, Vol. 72, p. 155.

be adjusted either by changing the speed of the phase-advancer or by diverting some of the field current from the series coils. The advancer takes the form of an exciter supplying magnetising current to the winding of the rotor, at slip frequency, and can be adjusted either to bring the power factor of the motor up to unity, or to make it take a leading current from the mains, thus helping to compensate for other motors. No separate exciter is required; the armature of the advancer is similar to that of a D.C. machine, and brush-gear is provided, to which the rotor leads are connected. The armature rotates in a magnetic field which is excited by a leading current drawn from one phase to produce a magnetic flux generating an E.M.F. in another phase.

The capital cost of both types of phase advancer is high, and for this reason they are unsuitable for smaller motors.

With a motor capable of taking a leading current with a phase advancer, it is possible to correct the low power factor of other induction motors forming part of the load. To take an example, if a consumer's total load consists of one large motor of 500-K.V.A. input at 90 per cent. power factor lagging, and small motors of 500 K.V.A. with an average power factor of 70 per cent. lagging, the average power factor of the whole load being 81 per cent., it is possible by running the large motor with a leading power factor of 95 per cent. to bring the power factor of the whole load up to about 96·8 per cent.

In the example given the consumer would speedily recover the cost of the phase advancer if his charges were on the basis of K.V.A. demand.

(*To be continued.*)

DIRECTION-FINDING BY WIRELESS TELEGRAPHY.

By CAPT. H. R. SANKEY, C.B., R.E. (ret.).

(*Abstract of lecture delivered at the Shipping Exhibition.*)

(*Concluded from page* 512.)

The new marine pattern direction-finder is a simplified form which is particularly easy to operate, as there are no complex tuning adjustments, all that is necessary being effected by turning one handle; the sharpness of tuning is satisfactorily maintained, and, owing to the incorporation of an amplifying detector of the most recent type, the receiving range is very considerably augmented. Fig. 14 is an external view, and a simplified diagram of connections is given in fig. 15.

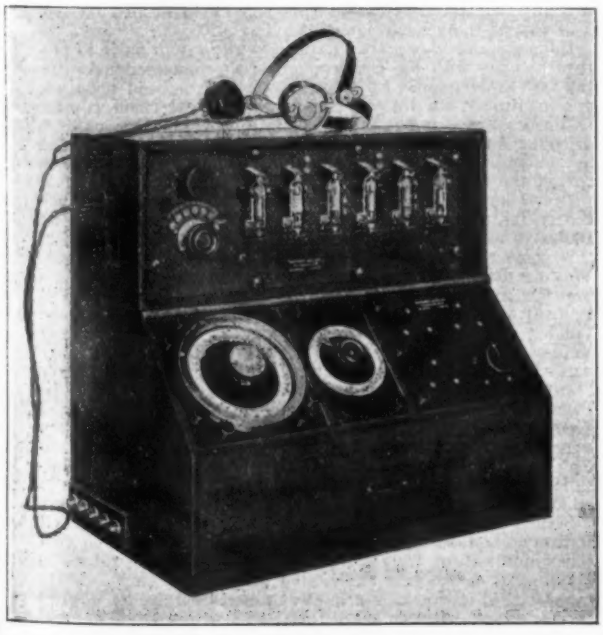


Fig. 14.—Marconi Marine Pattern Direction-finder.

With the exception of the batteries and the operator's 'phones the whole of the apparatus is contained in one unit, which is illustrated in fig. 14. In the teak case forming this unit are four metal-lined electrically-shielded compartments for the four component pieces of the apparatus, namely, the direction-finder coils and pointer, the transformer, the tuning condenser, and the amplifying detector. Each component is built up on an ebonite panel corresponding in size to the front of its compartment, and is held in position by ebonite-capped brass holding-down screws, which also serve as electrical connections.

This type of construction permits of any component being easily and rapidly removed for inspection and cleaning without in any way disturbing the remainder of the gear, and without

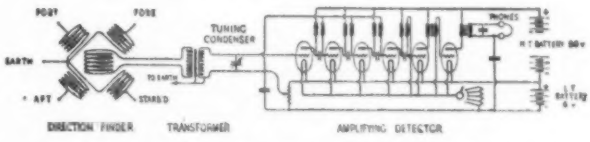


Fig. 15.—Diagram of Connections of Marine Direction-finder.

the necessity for breaking any soldered joints. Thus in case of accidental damage any component may be replaced on the spot, so avoiding the necessity of returning the complete apparatus for repair.

The appearance of the direction-finder component when removed from its compartment on the left of the containing case is illustrated in fig. 16. It is a "tightly-coupled," high

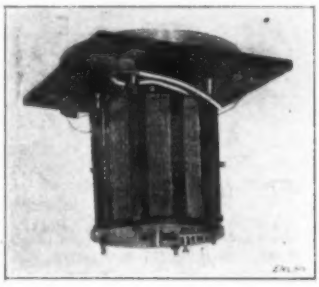


Fig. 16.—Direction-finder Component.

frequency transformer, having two independent primaries or field coils at right angles, embracing a rotatable secondary or search coil as in the case of the loosely coupled land pattern direction-finder. Each of the field coils has its centre point earthed, and is in circuit with one aerial, and the search coil is connected to the detector through the special transformer described below.

The transformer component, which is illustrated in fig. 17, consists of three highly insulated air-cored transformer elements, together with a range-changing switch. The windings of the transformer are designed for wave lengths of 300 to 800, 750 to 2,000, and 1,900 to 4,800 metres, but the exact ranges obtained will depend upon the size of the aerial.

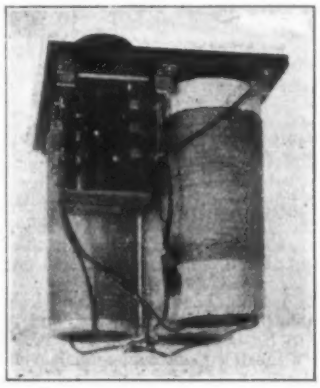


Fig. 17.—Transformer Component.

Between the primary and the secondary windings of each transformer element is an electrical shield, consisting of a copper sheath, which is connected to earth. The function of this shield is to protect the detector from the action of the non-directional component.

Tuning over the whole range corresponding to any setting of the switch is provided for by a specially designed variable air-condenser, fig. 18.

The amplifying detector, of which fig. 19 is a rear view, is mounted in the upright portion of the teak case. There are six valves altogether. The four on the right-hand side are of the Marconi "V. 24" pattern; the function of these is to amplify, in four stages, the high-frequency currents from the transformer. The fifth valve, which is of the Marconi "Q" pattern, acts as a rectifier or detector, and the sixth, a "V. 24," performs the functions of a "note magnifier," *i.e.*, it amplifies the rectified signals in the 'phone circuit.

On the left of the panel is a six-point variable resistance and switch for controlling the filament currents, and above this is a circular ebonite handle, the rotation of which regulates the electric pressure on the valves by acting on a potentiometer.

Suppose that a ship coming up the English Channel in foggy weather is somewhere to the west of the Channel Islands. It would ascertain its position by taking wireless bearings on Lands End and Ushant, a third reading on, say, Cherbourg, providing a check on the accuracy of these observations if required.

Under the conditions shown in fig. 20, the direction-finder indicates that Land's End is somewhere on a line making an angle of 66 deg. with the fore and aft line of the ship, and that the corresponding angle for Ushant is 5 deg. The direction in which the ship is heading is known, since it is given by the ordinary compass, and it is therefore a simple matter to combine the observations and set out the ship's position on a chart. Readings may be taken at frequent intervals if necessary, other stations such as Niton, Cherbourg, North Foreland, &c., being utilised as the ship proceeds on its course.

It is not always necessary to ascertain a ship's position, the direction of a known point being often all that is required. In such cases one observation only is necessary, as for example in ascertaining whether a ship's course will take it inside or outside a lightship or isolated lighthouse. A wireless signal from the lightship or lighthouse will settle the question as certainly as if the light were visible. Similarly, when about to enter harbour, signals from a station in the harbour will show immediately if the ship has drifted to one side of the entrance.

Apart from its use on board ship, the wireless direction-finder is applicable to aircraft navigation, and in this sphere it must prove to be of extraordinary value. It has been said, in fact, that the future of commercial aviation is bound up in the development of this method of navigation. Aircraft fitted with the wireless direction-finder are navigated in the manner just described, but if ordinary wireless only is carried navigation must be carried out by means of fixed direction-finding stations on the ground.

Referring to fig. 21, let us assume that X and Y are two fixed direction-finding stations which have been called up by the aeroplane Z, with a view to ascertaining its position. From the wireless signals sent out by Z the station X ascertains that the aeroplane is on a line making an angle of 110 deg. with true north, and at the station Y the angle is found to be 45 deg. The two directions so found are at once communicated by telegraph or telephone to the control station, where by drawing corresponding directional lines upon a chart and noting the point of intersection, the position of the aeroplane is ascertained. A brief wireless message from the control station then advises the aeroplane of its whereabouts at the time when the directional readings were taken.

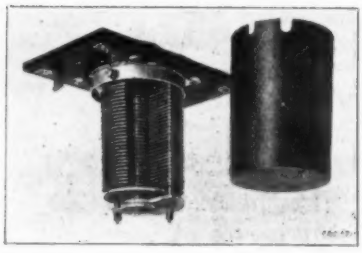


Fig. 18.—Variable Condenser.

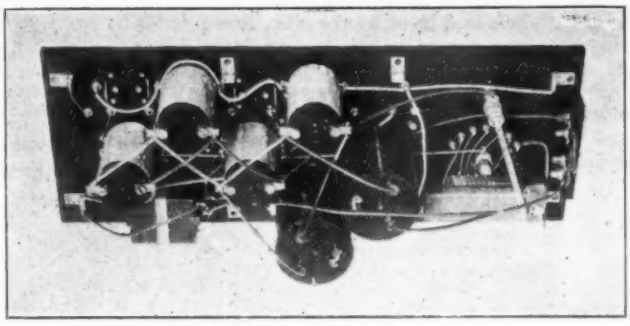


Fig. 19.—Detector Component, Rear View.

Fig. 20.—Navigation with the Direction-finder.

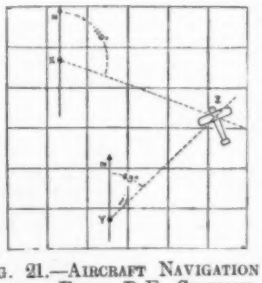


Fig. 21.—Aircraft Navigation with Fixed D.F. Stations.

THE LONDON UNDERGROUND RAILWAYS.*

(*Concluded from page* 506.)

Future Programme.

The programme of new works in immediate contemplation is as follows:—

City and South London Railway.—The scheme is to enlarge the existing tunnels which are only 10 ft. 2 in. up to 11 ft. 8¼ in. in diam., so as to take rolling-stock of modern type and construction similar in all respects to that in use on the London Electric Railway, and the station platforms to be lengthened so that five-car trains may be worked. This would greatly increase the traffic capacity of this railway; at the present it is unable to carry all the traffic that offers. Powers are also sought to construct subways and escalators at Clapham Common and Stockwell. Concurrently it will be necessary to purchase enirely new rolling-stock, amounting to 180 cars of standard type. The cost of the scheme as a whole is estimated at £1,800,000.

Euston and Camden Town connection.—The intention is to extend the City and South London Railway from Euston by a loop line to make a junction with the Hampstead section of the London Electric Railway south of Camden Town. When this work is completed it will be possible to run through services of trains from Golder's Green and Highgate to the City as well as to Charing Cross, which will provide a new through route from north to south of London without a change for the first time. This is a much needed facility. The cost of the scheme is estimated at £700,000.

Edgware and Hampstead Railway.—The intention is to proceed at once with the construction of the first section of this railway to Hendon. All necessary land has been acquired, and contracts are in preparation. This extension of over two miles will bring into immediate development an expanse of country for housing purposes, and will afford access to the new industrial area which has sprung up during the war. The cost of the first part of the scheme is estimated at £750,000.

Junctions at Hammersmith.—This scheme is to rearrange the tracks of the London Electric and Metropolitan District Railways west of Baron's Court and to carry four tracks from this point to join the four tracks of the London and South-Western Railway just east of Ravenscourt Park, and extending thence to Turnham Green. The Metropolitan District Railway has running powers over these tracks, and the London and South-Western Railway has agreed to confer similar running powers on the London Electric Railway. This will considerably improve the working of trains west of Earl's Court, and will also afford opportunities for extending the Piccadilly section of the London Electric Railway from Hammersmith to Richmond and Ealing. The cost of the scheme is estimated at £350,000. A cheaper and partial modification of this scheme has been under consideration as a possible intermediate measure. The cost is then reduced to £120,000.

Service to Upminster.—In conjunction with the Midland Railway (London-Tilbury section) it is intended to re-signal the whole railway from Bow Road to Barking and thence to Upminster, electrifying the section between Barking and Upminster and giving a much strengthened service of electric trains direct between the District Railway stations and

* From the *Railway Gazette*. Abstract.

Upminster. This will improve communication throughout the East End of London.

Escalators.—In addition to the proposals already mentioned to install escalators at Stockwell and Clapham Common, plans have been prepared to install escalators at Shepherd's Bush, Oxford Circus (Central London Railway), Tottenham Court Road, Bank (Central London Railway), Piccadilly Circus, Holborn, Trafalgar Square and King's Cross.

Stations.—A scheme for the improvement of access to and from Charing Cross Station is included in the London Electric Railway Bill before Parliament. A scheme for the lengthening of the station platforms at Aldgate East has been approved by Parliament and merely awaits an opportunity to be carried out.

Powers have been obtained for an extension of the Central London Railway from Shepherd's Bush to Gunnersbury to connect with the London and South-Western Railway to provide through services to Richmond and Twickenham. A railway from Wimbledon to Sutton, to be worked by a projection of the present District Railway service from Wimbledon. Proposals have been considered for (*a*) A junction of the Bakerloo section of the London Electric Railway with the City and South London Railway at Elephant and Castle and the extension of the City and South London Railway into South London from Clapham Common or direct from Elephant and Castle. (*b*) A junction between the Central London Railway and the Piccadilly section of the London Electric Railway at Holborn, or the construction of short connecting lines at this point to give direct rail access between them. (*c*) An extension of the Highgate branch of the Hampstead section of the London Electric Railway to Muswell Hill.

Mr. Pick said that the companies were committed to an expenditure of about £3,650,000 within the next few years. Their present capital resources in cash were negligible. Their reserve funds might be temporarily applied to the task, but would have ultimately to be withdrawn to meet the renewal expenditures for which they were ear-marked. It was estimated that the cash value of the existing capital powers of the companies, capable of being applied to the execution of the urgent programme of works indicated above, was slightly less than £2,000,000. It was in these circumstances that the companies primarily interested had promoted Bills in Parliament for this session to increase their capital powers and made provision for the cost of this programme. The London Electric Railway Co. sought authority to raise £1,000,000 of 4 per cent. debenture stock (rising under certain contingencies to 6 per cent., if only by that means could the money be obtained), of which not less than two-thirds should rank as second debentures. The City and South London Railway sought authority to raise £1,500,000 of 5 per cent. second debenture stock.

The construction of new tube railways for the future would be a slow process. The cost of a mile of double track tube railway at the present time, equipped for working, could not be less than £1,000,000. The passengers carried over this mile would each contribute to the net earnings an amount of 8·25d. at current rates of fare. To pay 5 per cent. upon the expenditure required a sum of £50,000 annually, which meant a traffic density of 37,500,000 passengers if each travelled just the 1 mile. The present traffic density of the London Electric

TABLE II.

—	1913.	1914.	1915.	1916.	1917.	1918.
	d.	d.	d.	d.	d.	d.
Average receipt, per passenger	1·70	1·68	1·82	1·83	1·84	1·91
Working expenses, per passenger	·79	·82	1·00	1·04	1·02	1·14
Net earnings, per passenger	·91	·86	·82	·79	·82	·77
Passengers booked per car-mile run... ...	5·3	5·3	4·7	5·	5·8	6·6
Expenses per cent. of earnings	47	49	55	57	55	59

*Increase of fares commenced.

railways was approximately 15,750,000 passengers per mile and of the Central London 15,000,000 approximately, but these figures were based upon an average length of journey of 2½ miles. This had been allowed for in arriving at the density. Even after allowing for the fact that each passenger travelled between 2 and 3 miles on the average, the present traffic densities of the tube railways would not be anything like sufficiently high to justify their construction at present levels of cost—in fact, as the figures showed, something less than half.

The progress of the underground system at this period would seem to be linked up with schemes by which the main-line railways entering London could be utilised as feeders and equipped for fast and frequent electric train services. The Watford extension of the Bakerloo section of the London Electric Railway was the exemplar. The proposed extension to Upminster would afford another example. Extensions were possible in connection with the Midland Railway at Hendon when the Edgware and Hampstead Railway was built to this point, in connection with the Great Northern Railway at Finsbury Park and with the South-Eastern and Chatham Railway from Elephant and Castle.

Increases of Fares.

The Underground group of companies claimed that the increases in fares made since the war were entirely caused by more than corresponding increases in working expenses and were justified by the results shown in the annual accounts of the companies. In proof of this claim Table II had been prepared.

From an analysis of the working costs per car-mile for 1913-18, Table III has been prepared.

TABLE III.

—	1913. Per mile.	1913. Standardised.	1918. Per mile.	1918. Standardised.	Jan.-March, 1919. Per mile.	Jan.-March, 1919. Standardised.
	d.		d.		d.	
Maintenance ...	·708	100	1·138	161	1·575	222
Power for tract'n	·812	100	2·045	252	1·974	243
Operating ...	1·761	100	3·114	177	3·894	221
All other costs...	·911	100	1·212	133	1·336	147
Total ...	4·192	100	7·509	179	8·779	209

Conclusion.

To close the evidence a statement was submitted giving, in summary form, the finacial position of the Underground companies as a whole. Over and above the usual items there was included the provision for deferred maintenance occasioned in consequence of the war. This was, needless to say, extraordinary in character. With all these inclusions, the reserves amounted to less than 10 per cent. of the gross traffic revenue and represented a charge per passenger not exceeding 0.13d. The general depreciation of the rolling-stock and equipment of the companies during the war period necessitated continually increasing sums being carried to reserve. Although maintenance costs did not recede, the money expended did not effect the usual amount of work, and there had been an accumulation of arrears of maintenance which must be carried out now. It must be remembered that the provision made for reserve on the basis of pre-war costs would be entirely inadequate to carry out the intended volume of work at post-war costs. While no attempt had been made to increase net earnings out of increased fares, in so far as the volume of passengers increased, it was always expected that each passenger should contribute something towards the net earnings of the companies. The companies hoped to continue to develop their traffic; additional passengers cost less to carry even when provided with adequate facilities. Nowadays, with money costing over 5 per cent., the whole future development of London transport hinged on the degree of success which could be attained with the money already spent.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING SEPTEMBER, 1919.

The official returns of imports and exports of electrical goods for September show, as regards exports, values of £652,857, as compared with £872,649 in the previous month, a reduction of £219,000, the falling off occurring in electrical goods, £45,000; insulated wire, £58,000; batteries, £26,000; telegraph and telephone material, £60,000; and machinery, £45,000.

The electrical imports for the month totalled £159,756, an increase of about £39,000, the increases appearing principally in machinery and telegraph and telephone apparatus.

It will be noted that the figures for lamp imports show a big reduction. September imports of glow lamps totalled £112, as compared with £29,160 for September, 1918.

The figures for re-exports of foreign and overseas electrical goods for September were £10,221, as compared with £9,971 for August.

Exports and Imports of Electrical Goods during September, 1919.

	Exports.	Imports.	Re-exports.
Electrical goods	£85,715	£37,902	£2,800
Insulated wire	183,167	1,639	—
Glow lamps	14,283	112	117
Arc do. and parts ...	22	5,017	18
Batteries	16,985	4,329	50
Meters	29,358	3,650	288
Machinery	198,389	66,635	6,467
Carbons	719	5,802	169
Telegraph and telephone material	124,219	34,677	312
	£652,857	£159,756	£10,221

THE SHIPPING, ENGINEERING, AND MACHINERY EXHIBITION.

(*Concluded from page 509.*)

Eng.-Capt J. E. Mortimer, 34, Victoria Street, London, S.W.1, exhibited a collection of the "Mortimer Patents" which are all designed to be fool-proof. A 3-ton overhead electric crane, manufactured by Messrs. J. Booth & Bros., Ltd., of Rodney Leeds, illustrated a special type of light construction. Messrs. Booth manufacture their own electric motors, and an example shown was a special ship's winch.

Lacy-Hulbert & Co., Ltd., 91, Victoria Street, London, S.W.1. This firm manufacturers pneumatic machinery generally, and the exhibit included a portable electrically-driven blower for cleaning dynamos, &c. The machine shown was a ½-h.p., 220-volt., d.c. set which could be easily carried about by one man. It is very compact and is an advance on the bulky home-made article often to be seen in power stations.

The Telephone Manufacturing Co., Ltd., Martell Road, West Dulwich, London, S.E.21, had on view a complete range of various types of automatic intercommunication telephones suitable for all classes of work. The novel "New System" secret auto-line finder and indicating intercommunicating telephone was publicly demonstrated for the first time; it represents a step forward in the development of this class of instrument. The "Laryngaphone" is adapted for the use of divers in conjunction with a semi-automatic indicator switchboard. The instrument, which has no mouthpiece represents a war development, and has hitherto been used for communication between pilot and observer on aircraft. A special feature is the possibility of conveying spoken messages in spite of any amount of noise. A range of mechanical movements, &c., embodied in the firm's standard apparatus was also shown. The electrical energy for working the exhibit was supplied by a C.A.V. dynamotor, accumulators, and power panel which was shown on the stand.

The Harbinger Boat Cranes, Ltd., 2-3, Norfolk Street, Strand, London, W.C.2. This firm's boat crane is designed with a view to safety and ease of handling ship's boats; it may be either hand- or electrically-operated. No skidding or shifting of the boats is necessary, and one crane can handle 6 or 8 boats, or more if required, according to position and arrangement. For the firm's electric cargo crane it is claimed that the masts in a ship, which at present are only use das derrick posts, and the steam winches may be dispensed with. One man can handle the crane and load by the use of which 33 per cent. of fuel and 25 per cent. of time is said to be economised.

Laurence, Scott & Co., Ltd., Gothic Works, Norwich, exhibited electrical equipment for deck winches which was shown in operation. By the use of this gear mechanical gearing is eliminated, the speed of working at all loads being controlled by an electrical "load discriminator." The motor and controller are completely watertight, and the latter can be stowed below decks. The gear is designed to stand the roughest usage and sea conditions. An electric steering gear, which gives control from the bridge, was shown in operation. The electric telemotor gear which transmits the control is on the Wheatstone bridge principle, but is very simple in character. The actual operation of the wheel is entirely electrical, the motor working direct on to the rudder-operating gear. The main motor is so controlled that it runs at a very low speed for the ordinary course-keeping motions, but runs up to full speed at once when large degrees of helm are suddenly required. Two standard 6-pole motors were also shown, coupled together and acting as a motor generator, for reducing voltage from the mains.

Hydrogen, Oxygen & Plant Co., Ltd., 1, Albemarle Street, Piccadilly, London, W.1, specialises in plant, including the electrolytic type, for the manufacture of hydrogen and oxygen gases. The latter plant is of the Bell type, with metallic electrodes. The consumption of energy is claimed to be 5.5 kw.-hours per 1 c.m. of hydrogen, plus 0.5 c.m. of oxygen, and the elements will support current considerably greater than the normal in the event of forced production being advantageous, as in the case of factories having variable quantities of excess power temporarily available.

J. Holden & Co., Ltd., 8, Albert Square, Manchester, had on view drawing office equipment and materials, including a new model of a continuous electric photo-copying machine, comprising a double pattern machine having two travelling arc lamps and special mechanical features in regard to the variation of speeds for printing the various photographic papers. The machines are made in both single and double patterns, and fitted with either one or two travelling arc lamps according to output of prints required. Considerable economies in current consumption and running charges are claimed for this machine.

Edison Accumulators, Ltd., 2-3, Duke Street, St. James', London, S.W.1, had on view a complete house-lighting plant actually working, and showing the use made of this firm's batteries. The company also exhibited batteries for use with wireless telegraphy and telephony, and for ignition and lighting on motor-cars, &c. A complete demonstration on the construction of the Edison cell and the active materials used was made, showing how totally different these accumulators are from the usual type.

The Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.4, showed a collection of exhibits almost identical with that shown at the recent exhibition at Westminster. The exhibit comprised various types of control gear, switches, and regulators. The machines that were shown in operation included a device for carrying out reliability tests on coils, and a special coil-winding machine. There was also a model of a telfer crane fitted with a model unit type electric lifting magnet.

James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.4. This firm's exhibit consisted of various ventilating apparatus, fans, and blowers, both belt and electrically-driven. The "Keith" ship-deck fan with direct-coupled, watertight electric motor and the reversing type of fan and motor combined for ship ventilation, were shown. With the latter type of fan the ventilation can be quickly reversed from exhausting air from, to blowing air into, the ship.

William McGeoch & Co., Ltd., 28, West Camphill Street, Glasgow, exhibited a large variety of ship's electrical and other fittings, such as pendants, brackets, bulkhead lamps in iron and brass to meet all requirements, and direction signs for cabin and deck use. Marine switchboards and switches, water-tight distributing boxes, fuse boxes, &c., were shown, as well as several patterns of flashing lamps could be seen in operation.

The Westinghouse Brake Co., Ltd., 82, York Road, King's Cross, London, N. This exhibit, amongst other things, included one 8-h.p. electrically-driven air compressor fitted with a Baker reducing gear, control governor and switchboard. The set is well adapted for operating the well-known Westinghouse automatic brake on electric cars, &c. A set of electro-pneumatic valve gear was also shown, suitable for operating the valve gear on floating docks, and for operating railway signals and points. The hydraulic valves are operated by compressed air, their movements being controlled from a central station by electrical means.

Warsnop & Co., Ltd., Lamp Works, Halifax, exhibited a variety of accumulators, also electric hand, table, and miners' lamps, as well as searchlights for yachts and small boats.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, London, W.C.2, in reality had two stands, and the equipment shown included a 1.5-kw. emergency set representing the wireless equipment on a modern liner. The emergency set is an auxiliary installation to be used in case of the failure of the ship's electricity supply. Demonstrations were given showing the musical spark discharger. A wireless direction-finder and a short-range wireless telephone set were also exhibited. The latter was rated at 20 watts and weighed only 40 lb., and when an aerial 70 ft. long and 30 ft. high is used gives a range of 10 miles. The set was in communication with a similar installation at the company's other stand. The 0.5 and 0.25-kw. ship's installations shown were similar to the 1.5-kw. set, and there was also on view a 100-watt aircraft telephone set designed for communication between machines in the air or on the ground. The set has a range of 50 to 100 miles, according to the type of receiving station when using a 250-ft. aerial. The wave length employed is 400 to 500 m.; the complete outfit weighs only 45 lb.

The Tok Manufacturing Co., Ltd., West Ham Lane, London, E. This company is exhibiting the first and only British-made snap rotary switch, which is being employed increasingly where, owing to the rush of current on switching on and the inductive break which occurs on switching off the ordinary tumbler switch is not suitable. This type of switch has hitherto been imported from America. The present company is, however, an entirely British concern, without any American connection, and the switches are entirely made in London.

Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Booth, Lancashire, had a selection of instruments and gear on view, which included a set of electric telegraphs as fitted in a number of generating stations throughout the country. An electric direction tell-tale is also fitted, which shows the movements of the engines either in the "ahead," "stop," or "astern" positions. Another interesting instrument shows the position of the engine-room telegraph, and is really an electric telegraph order repeater. It can be placed in any part of the ship, and shows at a glance the orders standing on the engine-room indicator.

The Sperry Gyroscope Co., Ltd., 15, Victoria Street, London, S.W.1. This firm had on view the "Sperry" high-intensity searchlight and the gyro navigational compass, in which the gyroscope is acted upon by the rotation of the earth. The Villiers odograph was shown, which is used in connection with the gyro compass and an electrical log, and

traces out on a chart the actual course which the ship has travelled.

Dictograph Telephones, Ltd., 7, Southwark Street, London, S.E.1, exhibited various types of and attachments for this instrument, being similar to those shown at the Westminster exhibition some time ago. The dictograph is a telephone which will liberate the spoken work so that it may be audible in any part of the room in which the instrument is placed, and there is no need to remain at the instrument whilst carrying on a conversation.

Messrs. Alloy Welding Processes, Ltd., 14-16, Cockspur Street, London, S.W.1, gave demonstrations of electric welding at frequent intervals. The exhibit consisted of samples of articles electrically welded, including built-up railway signal posts, large numbers of which, we understand, have been ordered for the Belgian railways. There were also shown electrodes for arc welding and others for depositing manganese and high-speed steel for wearing and cutting surfaces. There was seen in actual use a single unit motor-generator D.C. welding set, the motor of which is of only 1 H.P. Mounted on a truck for portability, the whole plant weighs only 32 cwt. There was also shown a semi-portable A.C. welding plant, consisting of a static transformer, reactance coil, and all necessary switchgear.

Explosives Trades, Ltd., 6, Cavendish Square, London, W.1. This exhibit was divided into three sections, namely, explosives, non-ferrous metals, and engineering, and included electric annealing and tempering furnaces. There was also an exhibition of welding by the Thermit process.

The A.C. Cutting and Welding Co., Ltd., 25-27, Theobalds Road, London, W.C.1, exhibited portable cutting and welding machines for use with A.C. power supply. Three types of apparatus were shown, one for light work, another for all metallic-arc work, and a similar apparatus that is also suitable for hole-boring, cutting, and casting filling. New types of electrodes, an electrode handle, as well as operators' accessories, were to be seen.

The Arcwell Co., 16, Hill Street, Finsbury, London, E.C. This exhibit consisted of an A.C. arc-welding machine, known as the "Mephisto," and various electrodes. This machine has been distributed in the U.S.A. and Canada, and now makes its appearance for the first time in this country. The welder operates on A.C. and at any voltage and frequency specified; the same machine can, if so ordered, be made to operate on several frequencies and voltages. The device is portable, light in weight, and has no loose parts. The current in the arc is maintained practically constant, so that the weld is not entirely dependent on the steadiness of the operator's hand. The machine consumes about 4 KW.; it is made in eight types and sizes from 100 amps. for ¼-in. plate to 250 amps. for 1.5-in. plate or heavy castings.

The Integral Oxygen Co., Ltd., 38, Victoria Street, London, S.W.1, had on view an improved electrolytic generator for the production of pure oxygen and hydrogen gases.

The Sterling Corporation (Great Britain), Ltd., 16, Wigmore Street, London, W.1, exhibited complete high-frequency sets, inclusive of switchboard, heat pads, and varied violet-ray applicators for use with the generator. The portable high-frequency generator is operated from any ordinary lamp socket and at any voltage from 90 to 250, for home treatment. Ozone inhalers, a pinozer for disinfecting, water sterilisers, and immersion heaters were also to be seen.

The Falkirk Iron Co., Ltd., Craven House, Kingsway, W.C.2, had on view a selection of steam- and electrically-heated cooking apparatus. This included a suite of two electrically-heated roasting and baking ovens, 22 in. × 22 in. + 26 in. high, one oven loaded to 5 KW., and the other, divided into two compartments for pastry baking, to 6 KW. The single oven electric range is fitted with four boiling and simmering rings. The electric steaming oven, 18 in. × 24 in. × 24 in., is capable of cooking 100 to 150 lb. of vegetables at a time, and is loaded to 5 KW. An electrically-heated carving table and Bain Marie, with a hot closet under the top and an assortment of electric grills, hot plates, fires, &c., were also on view.

F. Husband, Ltd., Craven House, Kingsway, London, W.C.1, exhibited tile pattern electric fires in several shades, and a comprehensive line of electrical accessories, such as switches, accumulators, ceiling roses, porcelain cleats, kettles, irons, saucepans, hot plates, &c. The tile pattern fires can be supplied in different shades of tiles, they are distinctive in appearance, and it is claimed will give 10 per cent. greater heat efficiency for energy consumed. They are made in two sizes: 3-bar, 2,400 watts, 3-heat control, and 2-bar, 1,600 watts, 2-heat control. In addition, two other types of fire are made by this firm.

Wm. Hamilton Wilson, 4-6, Bank, Broadway, Kingston Hill, Surrey.—This exhibit was similar to that shown at Westminster recently, and comprised wireless transmitters designed on a new combination of principles, tuning inductance, condensers, and transformers. Examples of a new type of highly sensitive thermo-electric conductor was on view for use over a wide range of purposes, some of which were less than 0.0005 in. in diameter. Interesting thermo-electric generators, one being operated by the heat of the hand, and an X-ray set were also to be seen.

Victory Dynamos & Motors, Ltd., 25, Victoria Street, London, S.W.1, had several shunt-wound motors which were seen running under full load conditions. Pairs of these machines were coupled back to back and mounted on a bed plate, running under the Hopkinson test.

Portable Electric Motors (1919), Ltd., 121, Victoria Street, London, S.W.1, exhibited portable motors of from ½ to 6 H.P. for drilling, reaming, and numerous other purposes. They run on either A.C. or D.C., the principal feature being light weight for power produced.

S. G. Brown, Ltd., Willesden Lane, North Acton, London, W. 3, was showing an all-British gyro-compass worked from the ship's mains on a balanced battery. The exhibit was seen working, and other objects on view included the "Cyclux" dynamo light for bicycles, telephone receivers, including loud speakers, condensers, and relays.

The Dutch section of the exhibition included a number of interesting exhibits, though most of them consisted of models. Kromhout Works, Amsterdam; Perman & Co., Ltd., 82-83, Fenchurch Street, London, E.C.2, exhibited a 12-H.P., single-cylinder, and a 4-cylinder, 180-B.H.P., 300 R.P.M., engine which operates on the 2-cycle system, and has neither valves nor electric ignition.

Werf Conrad, Ltd., Haarlem, and Store, Bros. & Co., Hengelo, Holland; Marine Works, Ltd., 39-41, New Bond Street, London, E.C.2, were showing a collection of eight modes, and also a D.C. turbo-dynamo and turbo-driven pumps.

The Ministry of Marine, The Hague, exhibited various electric lamps, oil burners, parabolic reflectors, and dioptic lens, designed and used by the Netherlands Lighthouse Service. The gas-filled electric lamps are supplied, we understand, by the Sloan Electrical Co., Ltd., 12, Golden Lane, London, E.C.

The Ministry of Colonies, The Hague. Included in this exhibit the Royal Dutch Meteorological Institute of Oceanography and Maritime Meteorology had on view a magnetic chart showing the values of the three elements drawn according to the values published in Dr. Van Bemmelen's work: "Magnetic Survey of the Dutch East Indies, made in 1903-1907." The first magnetic survey of the East Indian Isles was made by Dr. Van Rijckevorsel in 1874-1877.

Haarlemsche Machinefabrik v/h Gehr, Figee, Haarlem, Holland, B. J. Allison, 53, New Broad Street, London, E.C.2, exhibited models of cranes, and also brake magnets and accessories, and a controller for electric winch and deck crane.

A number of firms exhibited engines, both steam and internal combustion, built for driving dynamos, &c., as well as complete self-contained lighting sets. Besides the firms we have already mentioned as showing this class of machine, we noted the following:—

Messrs. Greenwood & Batley, Ltd., Albion Works, Leeds; a small De Laval steam-turbine ship-lighting set, which is made in all capacities. Rendle, Blanchard & Co., Ltd., 5, Victoria Street, London, S.W.1; examples of combined power units for high or low speeds and using either petrol, paraffin or gas. The engines are small and compact. R. A. Lister & Co., Ltd., 47, Victoria Street, London, S.W.1; automatic emergency lighting and power sets, which start up immediately the main supply fails or falls below a predetermined voltage. Stuart Turner, Ltd., Market Place, Henley-on-Thames; direct-coupled, self-contained lighting sets running on gas. Petters, Ltd., and Vickers-Petters, Ltd., 6, Dean's Yard, Westminster, London, S.W.1; oil engines made in stationary, portable, and semi-portable types, and designed to run on paraffin, starting on petrol, the change over being automatic. A semi-Diesel crude-oil engine was also shown; by the use of a patented device the engine will run on dead light load with perfect combustion and without the use of the lamp. Musgrave & Co., Ltd., St. Anne's Ironworks, Belfast; generating set, also generator and D.C. motor. W. H. Allen & Co., Ltd., Queen's Engineering Works, Bedford; high-speed, steam-driven D.C. and A.C. generators, also D.C. motor, contactor and master switches, relays, resistance units, brush holders, shunt windings, pole coils, terminals and boxes, and electric light fittings. Fyfe, Wilson & Co., 31, Budge Row, Cannon Street, London, E.C.4; petrol or paraffin generating sets. The Record Engineering Co., Ltd., Donnington House, Norfolk Street, Strand, London, W.C.2; petrol-paraffin or gas engines, features of which are silence and simplicity. Boulton & Paul, Ltd., Rose Lane Works, Norwich; radiator-cooled lighting sets suitable for country-house lighting. The Sunderland Forge & Engineering Co., Ltd., Sunderland; standard steam engines direct-coupled to D.C. generators, also D.C. and induction motors and 3-ton electric winches for shipyards, &c.

The Exhibition should have closed on the 17th inst., but owing to the railway strike it was kept open till Tuesday last; about 350,000 people are said to have visited the Exhibition.

The president, vice-presidents, and committee of the Exhibition, and the chairman and members of the Royal Commission for the Holland Section, gave an Anglo-Dutch dinner on the 15th inst. at Olympia.

Sir Owen Philipps, M.P., who presided, said that the Royal Commission for the Holland Section had co-operated most cordially in making the Engineering Exhibition a success. That joint effort, and the mutual interest aroused, would help

to cement still further the goodwill existing between the two countries. Shipowners, both English and Dutch, would have to be prepared to face a very difficult period in the not far distant future, when obsolete ships—and there were many afloat—would have to be scrapped. Only the newest vessels, equipped with all the latest improvements, would be able to hold their own on the seas. That was the position they had to face, and it was exhibitions such as that at Olympia that would help those who were ready to take advantage of all the latest improvements.

The Dutch Minister, responding, claimed that credit was due to the Dutch people for having remained neutral during the world struggle, in the sense of not taking part in the fighting, but without losing sight of the notion of right and wrong between the two fighting parties. The Dutch and British people had proved that they understood each other, and they had cemented a relationship which would be of great benefit to the new era.

NEW PATENTS APPLIED FOR, 1919.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

24,338. "Electrical fuses." British Electric Co. and B. G. Harrison. October 6th.
24,349. "Contacts for electric fuses, cut-outs, &c.," W. A. Harriman and A. Reyrolle & Co. October 6th
24,350. "Amplifiers, &c." S. Brydon. October 6th.
24,368. "Electro mechanical variable speed and reversing mechanisms." Anciens Etablissements Barbier Benard et Turenne and E. Granat. October 6th.
24,394. "Composite electric signnalling systems." Western Electric Co. (Western Electric Co.) October 6th
24,399. "Electric couplings or connectors." G. Suckling. October 6th.
24,400. "Electric hand lamps." G. Suckling. October 6th.
24,404. "Electric flash lamps." L. J. Hancock and Hancock & Co. October 6th.
24,405. "Transmitting apparatus for wireless telegraphy and telephony." J. B. Bolitho. October 6th.
24,406. "Amplifying devices for wireless telegraphy and telephony." J. B. Bolitho. October 6th.
24,407. "Receiving apparatus for wireless telegraphy and telephony." J. B. Bolitho. October 6th.
24,419. "Steam, hot-air, gas, or electric drier for hydros." G. Swinden. October 7th.
24,452. "Contactor type starters or controllers for three-phase motors." J. Evans and Harland & Wolff. October 7th.
24,464. "Cone or insulating body for ignition plugs, &c." G. de Holden-Stone. October 7th.
24,470. "Electric traction systems having conductor rails." Electrical Improvements, Ltd., and R. Pattison. October 7th.
24,480. "Electrically-heated melting, &c., furnaces." Morgan Crucible Co. and C. N. Speirs. October 7th.
24,492. "Sight gauge and splash plate for storage batteries." E. C. R. Marks. (Accumulators, Ltd.) October 7th.
24,495. "Protecting means for ignition coils of explosion motors." Scintilla. October 7th.
24,496. "Condenser for ignition apparatus of explosion motors." Scintilla. October 7th.
24,502. "Means for purifying liquids by electricity." L. G. Perrett and J. Wilson. October 7th.
24,556. "Contact for electric thief alarms, &c." F. Cressall. October 8th.
24,575. "Electrical protective devices." Western Electric Co. (Western Electric Co.) October 8th.
24,599. "Electrical resistances." W. Engelke and A. Lyon and Wrench. October 8th.
24,618. "Sparking plug." G. Dubreuil and E. L. Nachon. October 8th.
24,640. "Electrical apparatus." British Thomson-Houston Co. (General Electric Co.) October 8th.
24,644. "Thermionic tubes." J. Scott-Taggart. October 8th.
24,680. "Galvanic electric batteries." L. Fuller and Fuller's United Electric Works. October 9th.
24,683. "Earth detector switch." R. H. Lane. October 9th.
24,715. "Insulating means for electric apparatus." British Electric Transformer Co. and J. Rootham. October 9th.
24,718. "Galvanic batteries." G. Oldham, J. Oldham, O. Oldham, and Oldham & Sons. October 9th.
24,719. "Electric pocket lamps." Galvanophoren-Werk- (System Vogt) S. Szurbert Kommandit Ges. October 9th. (Germany, October 10th, 1918.)
24,722. "Electric generators, motors, &c." Allmanna Svenska Elektriska Aktiebolaget and A. Lindstrom. October 9th.
24,724. "Electrical seam welding machines." E. Schroder. October 9th. (Germany, May 30th, 1918.)
24,732. "Stationary electric induction apparatus." British Thomson-Houston Co. (General Electric Co.) October 9th.
24,736. "Wireless receiving apparatus." C. K. Chandler. October 9th.
24,738. "Electrical apparatus for operating railway signals." Soc. d'Electricite Mors. October 9th. (France, October 4th, 1918.)
24,750. "Locking device for electric switches." J. A. Vincent. October 10th.
24,770. "Fastener for link belting for driving motor car fans, dynamos, &c." L. J. Essenigh. October 10th.
24,773. "Electrically-operated doormat." T. S. Marshall. October 10th.
24,780. "Electric photographic printing or copying machines." J. B. Haldin and J. Haldin & Co. October 10th.
24,813. "Electrical resistance heaters for high temperatures." Soc. Anon. des Ateliers de Sechseron. October 10th. (Switzerland, October 10th, 1918.)
24,815. "Electric heating apparatus." British Thomson-Houston Co. (General Electric Co.) October 10th.
24,816. "Printing telegraph systems." Western Electric Co. (Western Electric Co.) October 10th.
24,831. "Dry battery cells." Portable Electric Current Patents Co. October 10th. (United States, October 10th, 1918.)
24,844. "Current distributors or commutators of electric ignition systems." F. A. Hoop. October 10th.
24,845. "Apparatus with variable self-inductance." E. C. R. Marks. (Vlug.) October 10th.
24,856. "Electric plug." W. P. Hammond and O. Kessler. October 10th.
24,864. "Trolley head for electrically-propelled vehicles." J. N. Lewis. October 11th.
24,903. "Wiring systems for electric light and power installations." L. J. Lepine. October 11th.
24,931. "Machine switching telephone systems." Western Electric Co. (Western Electric Co.) October 11th.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

12,961. Magnetic chucks. W. Arter. September 10th, 1917. (132,543.)
18,040. Machine switching telephone systems. Western Electric Co. and Polinkowsky. December 5th, 1917. (132,546.)

1918.

523. Method of and apparatus for receiving radio signals. Marconi Wireless Telegraph Co., of America. July 19th, 1917. (132,548.)
10,205. Electrolytic cells. H. C. Jenkins and East Stratford Works. June 20th, 1918. (132,561.)
10,382. High-frequency signalling. Western Electric Co. (Western Electric Co.) June 24th, 1918. (132,562.)
11,856. Means for measuring electrical currents. H. A. Ewen. July 19th, 1918. (132,567.)
13,207. Starting devices for alternating current dynamo-electric machines. British Thomson-Houston Co., H. C. Hastings, and J. Martin. August 14th, 1918. (132,574.)
13,208. Starting devices for alternating current dynamo-electric machines. British Thomson-Houston Co., H. C. Hastings, and J. Martin. August 14th, 1918. (132,575.)
13,267. Detachable clips for attaching electric cables to balloon cables. E. G. Cleverly. August 15th, 1918. (132,579.)
15,153. Dynamo-electric generators and motors. W. Aldred. September 18th, 1918. (132,607.)
15,187. Electro-magnetic switches. British Thomson-Houston Co. and H. C. Hastings. September 18th, 1918. (132,610.)
15,345. Electric blast furnace. J. Bibby and J. O. Boving. September 20th, 1918. (132,616.)
15,729. Appliance for operating signals and telegraphic codes. R. S. Pessell and E. L. Pessell. September 27th, 1918. (132,630.)
15,794. Electric bells. W. E. Clifton, H. W. Cox and J. H. Cowell. September 28th, 1918. (132,632.)
15,812. Electric furnaces. T. A. D. Lawton and J. Hampton. September 28th, 1918. (132,635.)
15,945. Manufacture of incandescent electric lamps. British Thomson-Houston Co. (General Electric Co.) October 1st, 1918. (132,638.)
18,207. Magnets of magneto-electric ignition apparatus. Scintilla (Firm of). November 6th, 1917. (120,901.)
18,714. Means for securing the pole shoes of a magneto machine. British Lighting and Ignition Co. and E. A. Bennett. November 14th, 1918. (132,665.)
18,836. Audion or lamp relay or amplifying apparatus. M. Latour. November 17th, 1917. (Addition to 3,140/18.) (132,668.)
19,310. Transmission of a rotational or turning movement in electrical switchgear. R. H. Barbour and H. R. C. Partridge. November 23rd, 1918. (132,673.)
19,792. Shock absorber and protector for electric lamps. J. W. Graham. November 30th, 1915. (132,678.)
20,285. Means for supporting overhead conductors on railways, tramways and the like. E. H. Whittall and B. J. Rees. December 6th, 1918. (132,681.)

1919.

619. Couplings or connectors for electric wires, cables, and the like. H. Moss. January 9th, 1919. (132,700.)
3,712. High-frequency generators. E. Girardeau. February 14th, 1918. (Addition to 12,809/13.) (132,734.)
4,098. Electric bell construction. A. E. Hughes. February 19th, 1919. (132,715.)
7,419. Joints for sparking plugs. D. Zimmermann and C. Plattier. March 25th, 1919. (132,727.)
9,837. Rotary electric converters. British Westinghouse Electric and Manufacturing Co. June 17th, 1918. (128,543.)
11,883. Shaft couplings and methods of manufacturing same. British Thomson-Houston Co. (General Electric Co.) May 12th, 1919. (132,754.)
12,259. Electric apparatus for indicating and repeating movement at a distance. Schneider et Cie. May 15th, 1919. (132,756.) (Addition to 10,676/18.)
18,580. Pawl and ratchet gear having an electro responsive releasing device. Aktiebolaget Svenska Kullager Fabriken. July 27th, 1918. (130,598.)

Overloading Generators.—While objections to overloading generators may usually hold good, there are times when it is a paying proposition to carry substantial overloads continuously. A writer in the *Electrical World* recalls a case where a 500-kw., d.c., waterwheel-driven generator was installed to run in parallel with a number of other generators and rotary converters. The energy was used for electrolytic purposes, and the machine was required to run 24 hours per day, seven days per week, being shut down only when in need of repair. When a machine was down a spare rotary converter was started. The power for the rotaries was generated by steam. It was found that the waterwheel on the new machine had greater capacity than was expected, and that at full gate the generator would have at least 100 kw. overload. The operating temperature was in excess of that recommended by the manufacturer, but the machine commutated well, and it was decided to run at full gate even at the risk of ruining the insulation within a few years. The particular machine has been in operation over five years and will probably last several more. Maintenance costs have been low. In that time it has been out of service only when necessary to turn the commutator or adjust the brushes, or when the waterwheel needed attention. If it had been run at its rating, it would have generated approximately 3,300 h.p.-years, but, running at 20 per cent. overload, it produced about 4,000 h.p.-years, a gain of 700 h.p.-years which otherwise would have been obtained from rotary converters getting their power from steam-driven generators. It cost $25 a h.p.-year to produce power by water against $100 by steam, a difference of $75. Therefore the gain of 700 h.p.-years represented a saving of $52,500. The machine could be shut down now for a year and still have a better financial standing than if it had run at its rating.